RAILROAD GAZETTE

FRIDAY, JUNE 22.

CONTENTS.

Contributions.

Monuments to Railroad Men.

CORNING, N. Y., June 14, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your last issue you mention the organization of the Potter Monument Commission, and say that you "do not recollect to have heard before of a statue erected to the memory of a railroad officer." I send to you by this mail a pamphlet containing the ceremonies and addresses of the unveiling of the monument of Hon. John Magee, Dec. 1, 1886, at Wellsboro, Pa. As you will see by the biographical sketch contained in the pamphlet, Mr. Magee was President of the railroad from Corning to Buffalo, an extensive railroad builder and a large operator of leased lines.

A. HARDT, Chief Engineer Fall Brook Coal Co.

Single Track Block Signaling on the C., M. & St. P.

MILWAUKEE, June 13, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There have been several articles in your paper within the past few months about blocking trains upon single track roads, and mention was particularly made of a system employed upon a Canadian road, whereby the spacing of trains was done by direction of the train dispatcher. The inference drawn from your editorial comments was that the road mentioned was entitled to the credit of a discovery.

A similar system was in successful operation upon the Council Bluffs Division of the Chicago, Milwaukee & St. Paul as long ago as 1883. * * * Before instituting the block system upon lines working mixed traffic, it was decided to give it a thorough trial upon a portion of the La Crosse Division, 14 miles in length (from Milwaukee to Brookfield), handling freight traffic exclusively.

The rules were put into effect on March 22 last, and the system has since that time worked perfectly. The grade inclines to the west, and in the distance an elevation of 267 ft. is overcome, although there are grades to the east respectively one mile, half mile and 2¼ miles long. The heaviest grade west bound is 47 ft. to the mile and east bound 42 ft. to the mile. There are two passing sidings, one located on a 33 ft., the other on a 47 ft. grade. Approximately 60 per cent. of the distance is curved, the maximum being 4°.

During busy seasons we handle over this portion of the line an average of 32 freight trains per day, the major portion of which are moved between midnight and 7 a. m. Our largest class freight engines are ten wheel connected, with 4 wheel truck and 19 × 26 cylinders. Their rating on this portion of the line is 35 loaded cars west-bound, and 50 east-bound, but they frequently handle as many as 70 cars, loaded and empty.

You will notice that there is no machinery, mechanical or electrical, connected with the system. All that is required is the block wire and the ordinary double-arm semaphore signal. While a distant signal would be of value in giving longer time to bring trains under control short of the block signal, it has not been found to be a *necessity*. The underlying theory of this system of "head on" blocking is to bring into use a new factor of safety (*i. e.*, the operators), retaining all the old safeguards and using this new factor independdently and adjunctive to a system heretofore the best that could be devised, but still one wherein the "human agency" has in its repeated failures shown the necessity for something better.

It may be urged that this is furthur sub-dividing the responsibility of train movement and that trainmen will fail to exercise proper caution, relying upon the block system to carry them through safely. In practice we have not found this to be the case. We have practically two sets of men controlling the movements of all trains within the blocked section, isolated from each other, and acting independently of each other: each governed by distinct rules fixing their responsibility. Being isolated they cannot lean upon each other, and to produce an accident, both must *fail*. The fact that in every instance where either fails, they check each other, makes detection certain, and has the direct effect of holding each man in his place to the highest sense of duty. In short, the system has realized the fullest expectation of its projectors, viz., the introduction of a new element in train movement that practically eliminates the danger of trains coming into collision. M.

[We copy below such of the rules governing the system as are distinctive. Some comment on this letter will be found in the editorial column.—EDITOR RAILROAD GAZETTE.]

The normal position of these signals [Double Arm Semaphore, one arm for east-bound and one for west-bound trains] will be at danger, where they will always remain, except when held at clear by the hand of the operator. A special wire will be set apart for the exclusive purpose of operating this system.

Operators will not permit a train to enter a block when a train is reported into the block from the opposite direction. To prevent opposing trains from entering a block simultaneously they will not permit east-bound trains to enter until they have notified the operator at the next block station east to block west-bound trains, using signal 58. See rule 10.

If a train is to turn out at their station to be passed by another train they will not clear the latter train at the next station back, until the first-named train has cleared the main line.

When operators at block stations have train orders, they will use the Swift Signal to indicate the fact to trainmen, an in addition thereto leave the block signal at danger until the orders are delivered.

(Rule 10.) When it is desired to block trains at stations ahead, or back, for any purpose, the following signals must be used: "47" block east bound trains. "58" block west-bound trains. When this signal is transmitted, the operator receiving it will respond "I. 13 B. 47" or "B. 58" as the case may be, and sign his initial and office call, and will block such trains until the block is reported clear.

Trains of an inferior class must not occupy the main line in any block when a train of a superior class is due to leave the first station in the rear.

There is nothing in these rules which relieves trainmen from the fullest observance of all the general and special rules governing the movement of trains.

Results of Continuous Steam Heating.

The following summary of a table presented in this issue gives the general drift of the experience of the roads reporting on the subject of continuous heating. The large table deserves careful study, but some of the main facts it contains are more clearly shown in the following summary:

Questions.	*Replies.*		
Number of systems in use or on trial			18
Number of reports made by railroads and sleeping car companies			34
No. 2.—What is heating medium?	Steam direct		18
	Steam direct and indirect		4
	Steam in connection with Baker heater		11
	Water direct		1
No. 3.—Is car heated by direct or indirect radiation?	Locomotive		34
No. 4.—From what source is heat taken?	All possible inside		7
	Under floor		25
No. 5.—Are main pipes inside or entirely under the floor of car?		Main.	Heating.
No. 6.—What pressure carried in main pipes?	Not exceeding	10 lbs. 12	14
	" "	20 " 4	2
No. 7.—What pressure carried in heating pipes?	" "	30 " 3	2
	" "	40 " 7	6
	" "	50 " 3	1
	" "	100 " 1	3*
No. 8.—Is any special provision made for ventilation of car?	Deck sash		3
	Yes		2
	No		22
No. 9.—If ventilation provided for, is air taken in at top of car or from below the floor?	Top of car		5
	Below floor		3
	Attention required.		
No. 10.—How is temperature regulated and does it require constant attention?	Little or none		12
	More or less		12
	Constant		5
	No reply		5
No. 11.—Time required to raise temperature of car to 70° when outside temperature is 20°?	About 15 minutes		2
	" 30 "		8
	" 45 "		6
	" 1 hour		5
	" 2 hours		6
	" 3 "		1
	Not stated		5
No. 12.—What provision is made for retaining a comfortable temperature after heat supply from main source is cut off?	Baker or similar heater		12
	Stoves retained		12
	Drum filled with brine		1
	Hot air drum		1
	No provision		4
No. 13.—For what length of time can this temperature be maintained, outside temperature 20° above zero?	One hour		11
	Two hours		3
	Three "		2
	Four "		1
No. 14.—How is water of condensation in main steam pipes as well as in heating pipes disposed of?	Trapped		26
	Returned to locomotive		3
	Drip		1
	Tank under car		1
No. 15.—If traps are used, what kind of instrument has been found most reliable?	Metal expansion		6
	Various makes		7
	Float trap		1
	Not yet found reliable		10
No. 16.—Is it necessary to permit steam to waste through rear coupling?	Yes		14
	No		16
No. 17.—Is it necessary to keep system charged with steam, or water heated, to prevent freezing?	Yes		9
	No		20
No. 18.—What kind of flexible connection has been used between cars?	Rubber hose		20
	Metallic		10
No. 19.—What kind of packing joints for keeping couplings tight have given most satisfactory results?	Rubber		17
	Vulcabeston		3
	Plumbago hemp		2
	Various, each		1
No. 20.—To what number of cars can the heat be transmitted?	About 6		5
	" 7		3
	" 9		1
	" 10		3
No. 21.—What has been the general results of the working of the system tried or in service?	Satisfactory		12
	Not entirely satisfactory		13
	Unsatisfactory		6

*In two cases these pressures are in water pipes of Baker heater, the steam pressure being less.

The Car Accountants' Convention.

The thirteenth annual convention of the International Association of Car Accountants convened at Hotel Windsor, Montreal, Can., June 20, about 100 members being present.

The first business of the meeting was the election of officers for the ensuing year, resulting as follows: President, A. P. Wilder, Atchison, Topeka & Santa Fe; Vice-President, John G. Hunt, Grand Trunk; Secretary, H. H. Lyon, Chicago & Alton; Treasurer, E. M. Horton, Illinois Central.

Very thorough reports from the following committees were presented, and will be taken up and acted upon by the Convention on the regular order of business during the session, viz.: Committee to wait on General Time Convention; Committee on Home Route Carding of Foreign Cars, Committee on Distribution of Cars; Committee on Per Diem.

Several heads of transportation departments of prominent roads are present and are participating actively in the proceedings, especially with regard to the question of car service advancement, through the adoption of the per diem system and better administrative organization of that department. A full report of the proceedings will be published hereafter, and much valuable statistical information upon this important subject may be expected.

The Arthur Kill Bridge.

The magnificent water front of Staten Island is so important a part of New York harbor, and access to it from the main land is so easy, that more or less definite projects for reaching it by railroad have been often brought forward. The Arthur Kill bridge, which is now nearing completion, will, if it is allowed to stand, enable the lines now entering Jersey City to reach directly the deep water on the Staten Island front, and will greatly increase the available capacity of the harbor for handling freight.

On the 13th inst. the great draw span of this bridge, the longest draw in the world, was swung into position across the Kill.

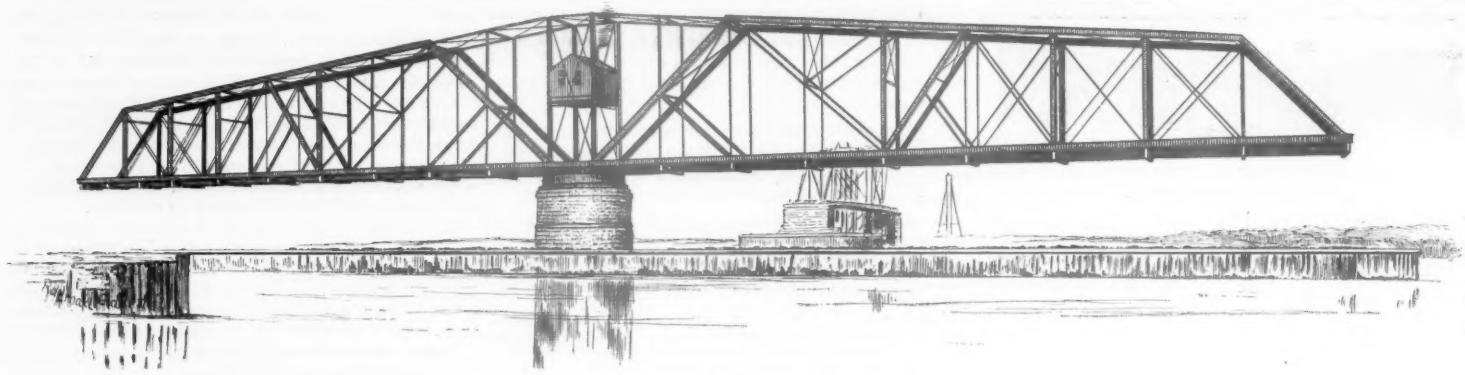
In 1885 Mr. Charles Ackenheil, Chief Engineer of the Staten Island Rapid Transit Railroad, located a line from Bound Brook, N. J., to Staten Island, and during the following year the site for the bridge was decided upon. A complete hydrographic survey of the Arthur Kill at the proposed bridge site, showing the depth of water, the currents, and locating the channel, was made. In order to verify the location of the piers, which was based on this survey, the actual courses taken by sailing vessels, steamboats, tugs and large tows were observed. These showed and to the satisfaction of the Chief Engineer, that the piers had been located properly. Plans for the crossing were then prepared and submitted to the Secretary of War, by whom they were approved in March, 1887. Construction was commenced in July of last year and carried on continuously through the winter, in field and shops, with the exception of about ten days when the masonry work on the piers was suspended on account of the severe cold.

Map of Location.

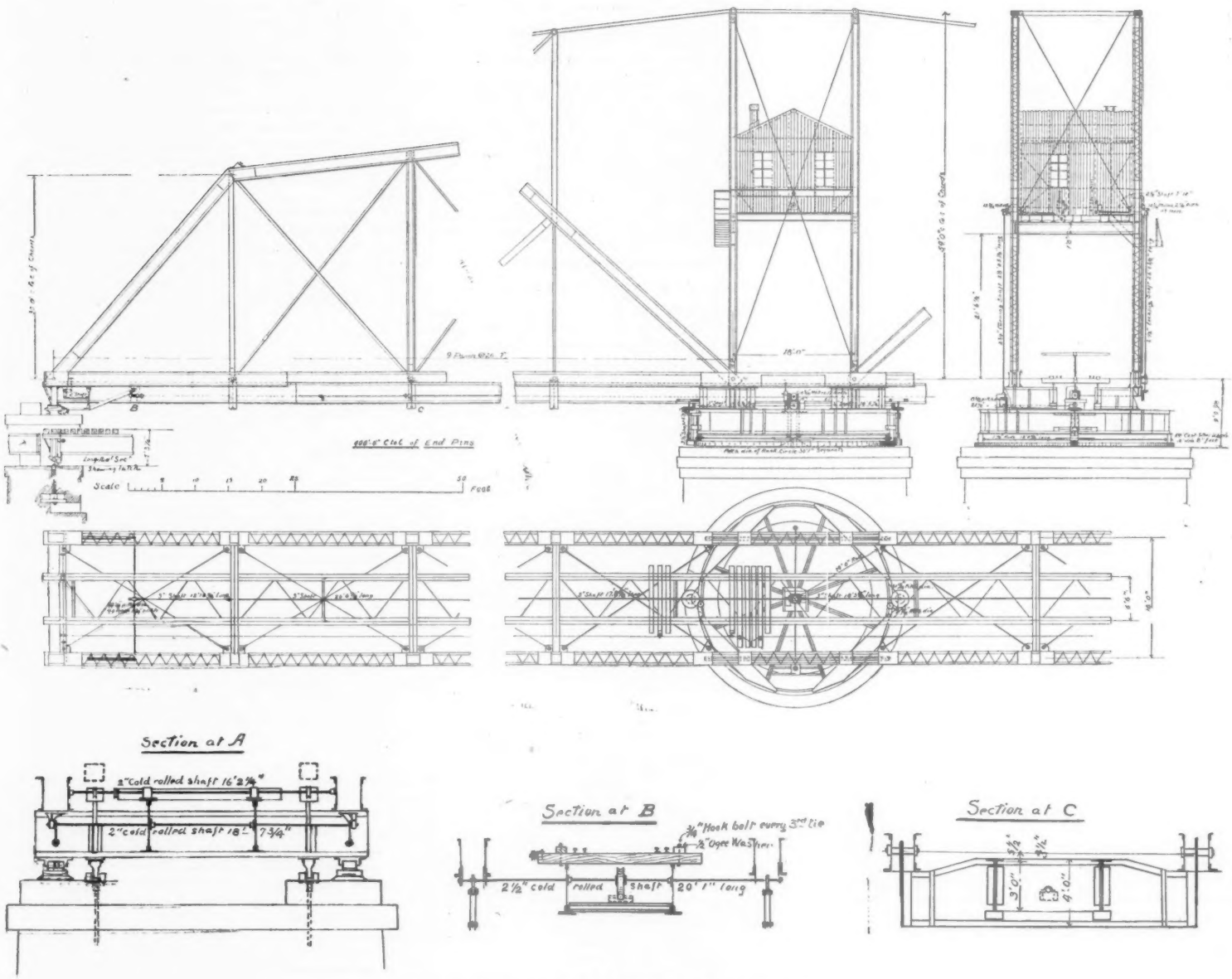
The bridge is composed of the draw and a fixed span at each end. The draw is 496 ft. 6 in. from centre to centre of end pins; 16 ft. from centre to centre of trusses, and weighs 656 tons. The clear water way of the eastern or Staten Island span is 206 ft. 3½ in., and of the other 214 ft. When the draw is closed, its two parts serve as fixed spans, and are independent of each other; when the bridge is swinging these spans are supported from the centre panel by steel eye bars. The centre panel is 18 ft. from centre to centre, and at each side are nine panels, each 26 ft. 7 in. The top and bottom chords and end posts are composed of latticed angles and web plates. The verticals are latticed channels. The web plates of the bottom and top chords are 24 in. deep, and those of the end posts 18 in. The inclined end post is 40 ft. 1 in. from centre to centre of pins; the first vertical is 30 ft. and the seventh 48 ft. The height of the bridge at the centre is 54 ft. from centre to centre of chords.

Each truss of each span is supported from the centre panel by six steel (all the rest of bridge is iron) eye bars, 1¼ by 6 in. The intermediate floor beams are latticed angles and web plates 4 ft. deep. The intermediate stringers are spaced 6 ft. 6 in. centre to centre, and are latticed angles and web plates 36 in. deep.

The draw is entirely rim-bearing. The weight is distributed on eight equidistant points on the drum of the turn-table. There are 54 conical, cast-steel rollers, 18 in. outside diameter, 17 7/16 in. inside diameter, and 8 in. face. The radial rods are 1⅛ in. in diameter at the smallest part, and 12⅝ ft. long. The tracks are 28 ft. in diameter and are built in segments, the joints being absolutely close and level. The ma-



View of Draw, from a Photograph taken just before it was swung.



Side Elevation, Section through Centre Panel, and Floor Plan.

THE ARTHUR KILL DRAW BRIDGE.

Built by the STATEN ISLAND RAPID TRANSIT RAILROAD CO.

sonry for the bottom tread was so accurately surfaced, in order to allow of an even track-bearing that it required but a film of cement to make a perfectly solid contact.

The rack for turning is 30 feet 1 inch in diameter. The engine and machinery are housed overhead, the space between the top of rails and floor being 20 feet. The engine is by Stokes & Parrish, of Philadelphia. In the engine room, from which point all the movements of the bridge are controlled, is an indicator or dial plate which records accurately the position of the draw at all times during the turning and locking. The boiler is located in the engine house. The locking gear is of the wedge pattern and is operated centrally from the engine through a line of shafting. The rails are so attached to the locking device as to be lifted from their sockets on the fixed spans at the first movement of the machinery. The turn-table is provided with two capstan heads and also additional locking gear, so that the bridge can be operated by means of levers by hand power when necessary. The time required to raise the rails and draw the wedges is one-half minute, and for opening the draw 90 degrees two and a half minutes, but it is expected that this time will be somewhat reduced.

Each fixed span is 150 ft. long, 25 ft. centre to centre of chords, and 15 ft. 6 in. centre to centre of trusses. The posts and top chords are latticed angles and webs, the bottom chords, eye bars

The bridge will carry double rails—gauntlet.

The approaches will be timber trestles, each shore being for some distance back from the water low and marshy. The contract for the trestle for the Staten Island approach has been awarded to C. McLane, of New York.

The masonry piers rest upon rock, or Jersey hard pan, the three deep-water piers being 20, 29 and 30 ft. below water level, respectively. They were put in by coffer-dams. The time fixed by the Congressional Act for the completion of the bridge expired June 16. The last stone was laid June 7 and the draw was turned three days before the expiration of the time.

Messrs. Boller & McGaw were the contractors for all substructure work and masonry. The bridge was designed and erected by the Keystone Bridge Company.

Mr. Charles Ackenheil made all the locations, supervised the construction of the bridge and is in charge of the projected terminal improvements. Mr. James L. Randolph, Consulting Engineer of the Baltimore & Ohio Railroad, was the consulting engineer for the superstructure, and all the plans were examined, corrected and approved by him.

The eastern end of the bridge will connect with the Staten Island Rapid Transit Railroad, which is now built to within a mile and a half. The western connection will be made by the Baltimore & New York Railroad by an independent line from the bridge to Bound Brook, at which place it will connect with the Philadelphia & Reading. A connection with the Central of New Jersey at any point between the Arthur Kill and Bound Brook is yet open, but has not been definitely determined upon.

The Master Car-Builders' Convention of 1888.

REVISION OF RULES OF INTERCHANGE.

The first order of business on Wednesday was the revision of Rules of Interchange.

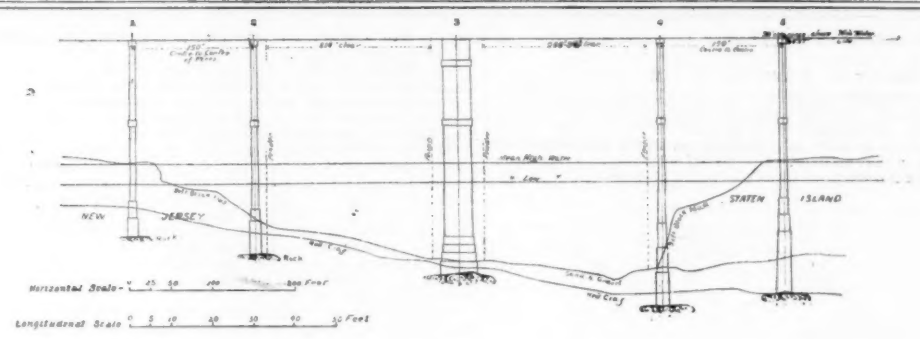
Mr. John W. Cloud, Vice-President, took the chair.

It was agreed to consider the rules seriatim.

The Secretary suggested that after the rules have been discussed and amended, a clean copy be made and read in order to insure a clean record of results.

Mr. MARDEN moved that Rule 3 read "cars *shall* be refused for the following defects."

Mr. WALL thought the word "*may*" now used enabled neighboring roads to agree as to waiving rules for mutual convenience.



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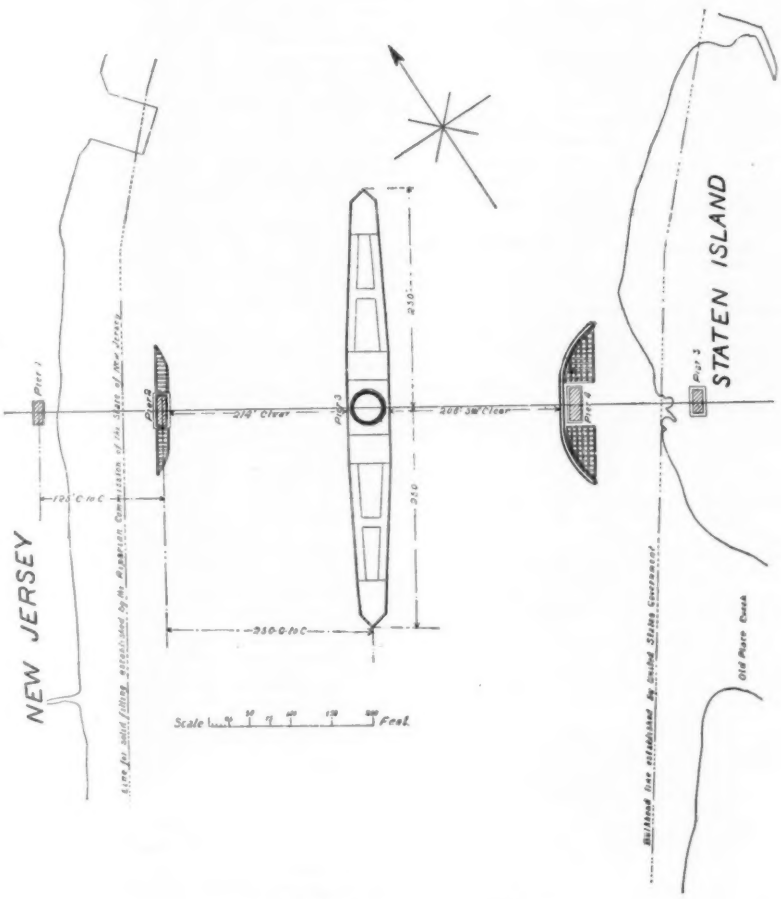
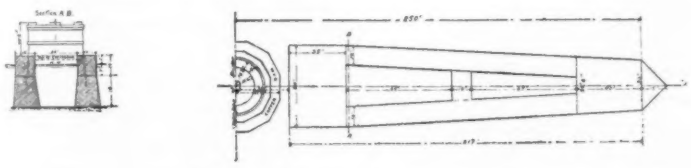


Plan Showing Piers and Fenders.



Plan and Section of Centre Pier and Fender.

THE ARTHUR KILL DRAWBRIDGE.

Mr. F. D. ADAMS thought rules should be positive and plain and supported Mr. Marden.

Mr. R. D. WADE thought that making the rule positive would prevent misunderstandings.

Mr. WALL though the word "*may*" gave needed latitude to enable cars to be received or rejected. Motion lost.

Mr. FORSYTH moved that the wheel flange in position with the wheel defect gauge be shown full size in section *h*, Rule 3. The motion was carried.

Mr. D. C. RICHARDSON asked when an axle became a second-hand axle.

Mr. ADAMS thought anything that had been used once was second-hand.

Mr. CLOUD agreed with Mr. Adams.

Mr. BLACKALL thought that the proper diameter in the wheel fit was important, and moved that a limit be placed on the diameters of axles at the middle and in the wheel fit.

Mr. ADAMS moved that the centre of axle for 60,000 lb. cars measure 4¾ in. diamater.

Mr. WALL moved it be referred to a special committee of five.

Mr. MARDEN moved that the size of journals be increased and questions be referred to the committee.

Mr. Wall accepted this addition to his motion and it was carried.

Messrs. Wall, Marden, Verbryck, Forsyth and McWood were appointed as special committee to report to this Convention on limit of size of journals, etc, referred to in Rule 3 section *j*.

Mr. BLACKALL thought a limit should be placed on the thickness of steel tires. It was objected that steel tires were little used in freight service.

Mr. ADAMS said he was placing many old steel-tired wheels under freight service. The motion was, however, withdrawn.

Mr. WALL thought some explanation was needed of the interpretation of the rules used on some New England roads. These interpretations were found unnecessary further west, and if necessary should be incorporated in the rules of interchange.

Mr. MARDEN said the object of the interpretation was to obtain uniform inspection, especially on the Erie line, between Boston & Chicago. The rules were not generally understood.

Mr. BLACKALL was surprised that the interpretations were not brought forward previously.

Mr. KIRBY found that there were many different interpretations in different parts of the country, and urged that a uniform interpretation be agreed on and inserted in rules.

Mr. MARDEN said the interpretations would only affect the Erie line.

Mr. WALL urged that the interpretations should be considered, so that a uniform code of rules may be adopted throughout the whole country.

Mr. ADAMS thought it difficult to make the English language bear the same meaning to every reader. The Boston & Albany and New York Central had agreed upon an interpretation, but had not alterated the Rules. The interpretations had worked well.

Mr. WALL moved that Mr. Kirby's interpretations be read and considered with the rules.

Mr. JOHN MACKENZIE moved that any member move interpretations.

Mr. CLOUD thought it would be advantageous to have general inspectors to look after the local inspectors and insure uniformity of inspection, and that inspectors should meet and discuss details of their practice in working rules.

Mr. WALL asked if interpretations rejected at the convention would still be followed by railroads using them.

Mr. ADAMS moved an amendment to Rule 3 section *g*, relating to chipped wheels.

Mr. H. S. BRYAN thought chipped wheels were broken wheels, and should consequently be rejected by inspectors under section *c*, Rule 3.

Mr. J. N. BARR moved that section *g* read "wheels with flanges chipped."

Mr. WALL supported Mr. Barr's motion.

Mr. ADAMS thought words "unsafe to run" were valuable and should be retained.

The motion was lost.

Mr. WAGNER moved that a chip should exceed 2 in. wide, ¾ in. deep or ⅛ in. below centre to cause a wheel to be rejected.

Mr. SCHROYER moved that 1½ in., ¼ in., and ⅛ in. be the dimensions, as chips were liable to increase in size in running 1,000 miles. He considered a chipped wheel as broken.

Mr. WAGNER though a broken wheel was unsafe, while a chipped wheel might run for years.

Mr. Schroyer's motion was carried.

Mr. CASANAVE called attention to interpretation of Rule 3 section *i*, "Axles bent or wheels improperly bored so that wheels are ⅛ in. in winding."

Mr. SCHROYER thought some provision should be made for rejecting wheels improperly pressed on the axle, which often caused hot boxes.

Mr. WALL hoped that roads would abide by the decision of the Convention.

Mr. KIRBY moved that the question of receiving or rejecting interpretations as a whole be voted on.

Mr. LENTZ wished that interpretations adopted by Association should supersede special interpretations.

Mr. ADAMS said over 10 fatal accidents had happened on his road within the last three years owing to brakes being in bad order, and read very detailed interpretations of the conditions which cause a car to be rejected for brakes in bad order on his road.

Mr. WALL moved that a committee of three report on incorporating interpretation in Rule 3, sections *m*, *n*, *o* and *p*, which relate to brakes, draw-bars and draft sills, etc.

The motion was carried.

Messrs. Casanave, MacKenzie and Miller were nominated as this committee.

Mr. LENTZ stated that the Central Railroad Club recommended that Rule 3, section *r*, should read: "Roofs of merchandise and grain cars should be whole, sound and securely fastened."

Mr. ADAMS moved that floors be added to the above, and section *r* read:

"Roofs or floors of merchandise or grain cars which leak or which are not whole, sound or securely fastened."

Messrs. Schroyer, Barr and Verbryck thought the conditions of floors could not be ascertained when the cars were loaded.

The motion was lost and section *r* stands.

Section *t* was referred to the committee above named.

Mr. FORSYTH moved that a new section *u* be added to Rule 3, reading:

"Air brake hose and coupling lost or injured."

Thirty-two voted in favor and 11 against, and the motion was consequently carried.

Mr. BARR moved the addition of section *v*: "Permanent grain doors missing."

Mr. VERBRYCK and Mr. ADAMS opposed this addition, which was supported by Mr. Robert Miller.

The motion was lost.

Mr. MARDEN, in considering Rule 4, moved that two defect cards be used, one for defects that are collectible, and another for defects that are not collectible.

Mr. SCHROYER complained that many cards were only printed and filled in on one side.

Mr. ADAMS thought that provision should be made for old defects.

Mr. SCHROYER said that many Western roads were using "old defect cards," noting general conditions of car when received.

Mr. MARDEN said this met his views, as old defects should not be classed with new defects. He would prefer to repair some defects at his own shops.

The question was referred to the committee on sections *m*, *n*, *o*, *p* and *t* of Rule 3.

The Secretary moved that Messrs. Schroyer, Chamberlin and Middleton be appointed a committee to prepare a clear copy of revised rules.

The motion was lost.

Mr. CLOUD suggested that the Secretary should prepare a copy and that the members should assist him in verifying it.

The meeting then adjourned till the afternoon.

[Further discussion of this subject was given in our issue of June 15, p. 386.]

MORNING SESSION, THURSDAY, JUNE 14.

The Committee on Subjects to be reported on and discussed at the next convention proposed the following subjects:

1. Code of rules for interchange of passenger cars, including sleeping cars.

2. Standard journal box for 60,000-lb. car, and standard box cover 40,000-lb. car.

3. Standard brake gear and brake shoe for metallic brake beams.

4. Journal lubrication and the best method of economizing oil.

5. Car heating and lighting.

6. Buffer for the M. C. B. type of coupler.

Report received and Committee discharged.

Resolved that roll be called at 12 noon.

The Committee on Freight Train Brakes then presented their report, which was printed on page 386 of the last issue of the *Railroad Gazette*.

MR. R. C. BLACKALL moved that the report be received, the Committee thanked for their services, and the recommendation of the Committee as to the appointment of a committee on brake gear adopted.

MR. ADAMS moved postponement of discussion until next year.

The report of the Commitee on Car Roofs was then read, as follows:

REPORT OF COMMITTEE ON BEST FORM AND CONSTRUCTION OF CAR ROOFS.

In your Committee report at the last convention they mentioned some of the leading objections to the different forms of car roofs, particularly the roofs that were exposed on the under side, but protected on the top. These objections were considered to be very weighty.

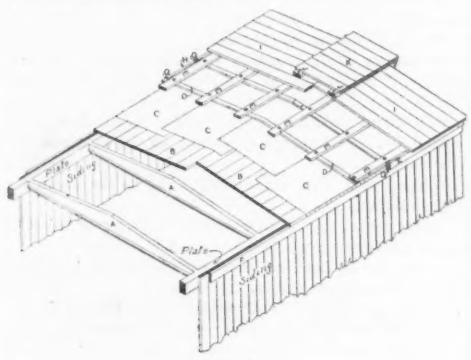


Fig. 1.

A. Carlines. B. Lower course of boards.
C. Felt. D. Battens.
E. Purlins. F. Facia.
G. Distance piece. H. Cornice.
I. Top course of roof boards.
J. Running board bearers. K. Running board.

Your Committees also expressed their opinion on what is needed to make a durable and substantial roof, that would not only last the lifetime of a car without continual repairs, but would actually increase the lifetime by giving such protection as would prevent leakage and decay in all latitudes; a roof protected on the under side as well as on the top, and doing service as part of the car frame, to stiffen and strengthen it.

After considerable investigation they have not found any good reason to change that opinion, and they have not yet come across any one roof that fulfills all necessary conditions, neither do they feel justified in eliminating any of the present forms of patent roofs.

It is quite evident that the plastic type of roof (*i. e.*, the asphalt roof and other compositions) is fast coming into favor, and doubtless is the equal of the present types of metal roofs in use. Both systems, plastic and metal, have about an equal footing, and neither can be ignored, even were your Committee disposed so to act.

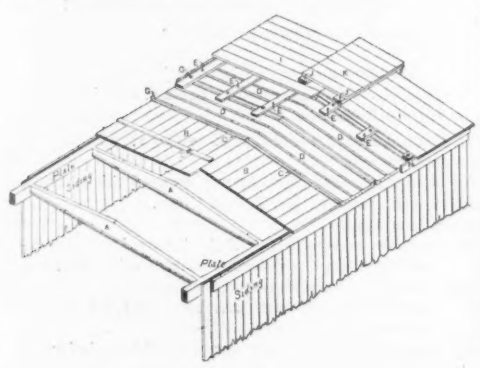


Fig. 2.

C. Battens. D. Galvanized iron.
Other references as in Fig. 1.

Your Committee would therefore recommend that boards (say ⅞ in. thick and matched) be laid longitudinally on the carlines, for the protection of the waterproof material on the under side, as well as adding stiffness and strength to the car frame; on this bottom lay the waterproof material—iron, asphalt or other composition.

Your Committee also recommend that the Association decide on the most suitable width for iron (say 30 or 36 in.) and impress upon the different roofing companies the necessity of conforming to the same as a standard width.

To protect the roof on top, matched boards ⅞ in. thick, should be laid transversely, on purlins where space is required between, and if no space is required, it can be fixed right on the waterproof material.

Prints showing the ideal roof with different forms of waterproof material accompany this report.

J. D. MCILWAIN,
SAM'L IRVIN,
WM. FORSYTH,
Committee.

MR. CLOUD asked if width of iron recommended applied to usual forms of iron roofs.

MR. MCILWAIN explained that it applied particularly to form recommended by Committee where the underside of the iron roof was protected.

The Committee on Car Heating then presented their report.

REPORT OF COMMITTEE ON CAR HEATING.*

Your Committee appointed to report on the subject of car-heating beg to say, that early in the year they instituted a series of inquiries, addressed to most of the railroad companies, with a view of obtaining as much information as possible in that manner. No special provision having been made for the work of the Committee this seemed to be the

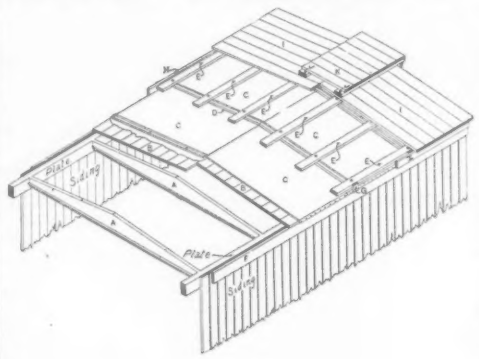


Fig. 3.

C. Sheet iron. D. Iron battens.
Other references as in Fig. 1.

only available method, and the report is based entirely on the information so obtained.

While it was the endeavor and intention to report upon all the improved methods of heating cars, the interest and attention which is now being given to what may be called continuous heating, in an attempt by the railroad companies to comply with public sentiment, and the legislative action in some states seems to have engrossed the general attention, and has been the subject of all the information that we are able to present.

It may not be out of place in this connection to state that from the best information at the hands of your Committee there has been legislation on the question of car stoves in three states.

In Massachusetts a law was passed in 1887 which is brief in its terms and as follows:

"No passenger, mail or baggage car on any railroad in

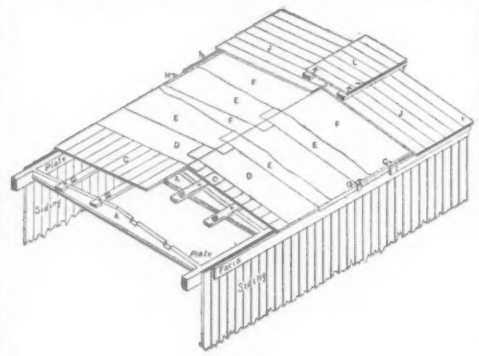


Fig. 4.

A. Carlines.
B. Purlins.
C. Lower course of boards.
D. Dry felt.
E. Saturated felt.
F. Roofing compound.
G. Wooden strips.
H. Distance piece.
I. Outside cornice.
J. Top course of roof boards.
K. Running board bearers.
L. Running board.

this commonwealth shall be heated by any method of heating or by any furnace or heater unless such method or the use of such furnace or heater shall first have been approved in writing by the Board of Railroad Commissioners, provided, however, that in no event shall a common stove be allowed in any such car; and provided, also, that any railroad corporation may, with the permission of such Board, make such experiments in heating their passenger cars as said Board may deem proper."

"Any railroad corporation violating any of the provisions of the preceding section shall forfeit a sum not exceeding $500.

"This act shall take effect upon its passage."

In New York a law was passed by the legislature in 1887, which reads as follows:

"It shall not be lawful for any steam railroad doing business in this state, after the 1st of May, 1888, to heat its passenger cars, on other than mixed trains, by any stove or furnace kept inside the car or suspended therefrom, except it may be lawful in case of accident or other emergency to temporarily use such stove or furnace with necessary fuel. Provided that in cars which have been equipped with apparatus to heat by steam, hot water or hot air from the locomotive, or from a special car, the present stove may be retained, to be used only when the car is standing still. And, provided, also that this act shall not apply to railroads less than 50 miles in length, nor to the use of stoves of a pattern and kind to be approved by the railroad commissioners for cooking purposes in dining-room cars."

Under this law the companies had until this spring to make the required alterations.

In Michigan, also in 1887, the legislature passed a law by which it provided:†

"That on and after the first day of November, 1888, every railroad company owning or operating any railroad wholly or partially in this state shall make some effective provision against the burning of cars in which passengers are carried in some one of the following or equally effective methods:

"By having the heat for warming the cars outside the car, or by inclosing the heat in a closet or room made of boiler-iron or some other material which will afford equal protection against the car taking fire, and by some device by which the fires will be effectually and quickly extinguished, in case the car is overturned."

Some legislative action has been taken in Maine, but your Committee failed to get a positive statement of the law.

The subject has also been before the legislatures in Connecticut, Ohio and Illinois, and the Railroad Commission of Iowa have recommended some legislation on this point, but no final action had been taken in any of these States.

In an endeavor to comply with the laws, as well as to conform to the pressure of public feeling in the matter, and to ascertain its real desirability, a number of railroad companies have, from the tenor of their reports, engaged in a series of costly and difficult experiments, and have been persistently pursuing them in an attempt to solve a problem which is accompanied with more than usual difficulties in its details. A general result is shown in the tabulated statement appended to this report.

It is only fair to the different systems represented in this statement to say that these inquiries were made during the past winter. That since that time many important changes in the details have been made with marked improvement. The Committee regret that these changes were made so late in the season that they are unable to give you definite information regarding them, but call your attention to the last column of the statement as giving the views of the different railroad companies at the close of the past winter.

The most prominent features of continuous heating common to all systems are the couplers and the pressure of steam to be used. The first has been very generally discussed by the railroad clubs of the country, and an effort made by a committee representing the leading trunk lines of the East, to arrive at some one standard practice in this respect, an endeavor which is much to be commended. From the fact that many systems prefer the metallic connection, and the return system requiring a double connection and an additional train pipe, the adoption of such a standard is likely to be only reached by a compromise, if at all.

In regard to the steam pressure, your Committee believe that there can be but one opinion in this matter, that it should be kept as low as possible, that the rupture of a highly charged steam pipe in a car filled with passengers would prove quite as disastrous as the co-called "deadly car stove," and the effect of high pressure steam escaping from the traps and rear of train pipes has been commented on as very objectionable in its effect on the paint and varnish of the cars, as well as from condensation about stations.

A point upon which the Committee laid some stress was in regard to the means provided for retaining heat in the car after the locomotive or source of heat was disconnected. This still appears to be an open question. All materials which are slow in giving up their heat, either from bulk or physicial properties, are correspondingly long in attaining the desired temperature, so that to obtain one involves a sacrifice of the other. The retention of the stoves within the cars; the use of hot water circulation; or a drum filled with brine, within the steam-pipe, seem to have been the most general ways of accomplishing this end.

With appliances such as seem necessary to use for successful continuous heating it is fair to expect occasional failures of the apparatus, disabling it to an extent as to prevent its use. To best provide for such emergencies is still one of the unsolved problems.

Upon a subject so important, about which there are so many differences of opinion, as well as apparent differences of result, your Committee are unprepared to make any definite recommendations, and while regretting their inability to give you more information on a subject of such general importance, beg leave to suggest that it be continued for investigation throughout the coming year.

Respectfully,

(Signed) FRANK L. SHEPPARD,
R. W. WADE,
ROBERT MILLER,
Chairman.

MR. ADAMS had adopted the Martin system and would equip all cars.

MR. TURREFF had used a system for four years which had given great satisfaction.

MR. BLACKALL had used the McElroy since last November. On a trial in February the pressure was 45 lbs. on the locomotive and 25 lbs. on 12th car. The McElroy coupling uncoupled readily both with steam on and steam off. On his road they made it a practice to shut off the drip one mile before reaching a station, so that there is no frozen drip at the stations. Where cars stand for some time, they are heated with steam from the shop near where car stands, or the water is blown out. He had never had trouble, even in weather 35 deg. below. A car will not freeze when detached from engine for one hour, the heat being retained in Baker system, and falling only 2 deg. in experiment.

MR. ADAMS, in order to keep cars warm while standing, attached a hose from stationary boilers which are generally found at stations. No trouble in providing connections; proposes to keep cars warm all the time. No material objection to drip of condensation at stations.

MR. E. CHAMBERLAIN (New York Central) confirmed Mr. Adams, but to overcome any difficulty he placed a 25 gallon tank under trap with globe discharge valve with handle inside of car, with jet of steam ¼ in. dia. The condensation could then be blown off at any point. The capacity of tank was sufficient to allow the car to stand 30 minutes at a station. When the car left the valve was opened, and tank was emptied. This arrangement had worked well last winter. He also used auxiliary heating when standing by means of stationary boiler.

MR. MARDEN had investigated the different systems. He had equipped two trains with the Sewall and succeeded in obtaining very satisfactory results. Fifteen trains were running last winter and gave no trouble whatever. He believed thoroughly in the economy of steam heating. His road had given an order to fit the entire equipment with the Sewall system. He would still carry one stove in each car for emergencies. He used stationary boiler at depots and wherever cars are cleaned to keep cars warm while being cleaned. Continuous heating was the coming heat. The large number of different roads using it proved this. Different systems may be used by different roads, but it was agreed that there should be only one coupler.

MR. BARR (Chicago, Milwaukee & St. Paul) had different circumstances in the Northwest, long distances and intense cold, and he concludes they cannot have supply pipe under car. His road uses a pipe overhead, giving continuous fall from steam pipe to trap. A car cut out requires no atten-

* The tabular statement accompanying this report is given as an inset in this number.

† The law is somewhat incorrectly stated here, and the corrections necessary are referred to in the discussion on the report given below.—EDITOR R. R. GAZETTE.

tion, drainage takes care of itself, while with underneath system it is likely to fail and condensation freezes. The couplings used acts very well, remains tight and seems durable. Extensive trials with underneath pipe system were made, but we want something better. If overhead system should be successful it would save a good deal of trouble.

Mr. MILLER tried two systems, one train Wilder, one Sewall; no difficulty with latter; coupling very simple. The coupler was the vital part, and a uniform coupling was very desirable. There were several very simple couplings. The only question was the durability of rubber, which provided better for oscillation and movement than any metallic couplings, which must be complicated and wear. When new they work well. The Martin works well, as far as heating cars is concerned. Underneath pipe works well in our temperature.

Mr. BUSHNELL (Burlington, Cedar Rapids & Northern) has trains heated with steam, placing pipes in car. Metallic coupling gives good satisfaction: no leakage.

The CHAIRMAN invited any railroad commissioner present to speak.

Mr. RICKARD, Commissioner for State New York: The question of steam heating must be settled this coming winter. He wished, however, to listen to suggestions of Association.

Mr. MARTIN: It does not much matter which system is adopted, the real question is the adoption of a universal car coupler. After that, trial will demonstrate the best system. It was unfair to ask railroads to adopt any system, forcing it on them at a moment's notice. He considered that bad ventilation was almost as bad as cold cars, and hoped that the Association will attend to the subject of ventilation. Automatic car couplers were general, but further progress was desirable.

Mr. CLOUD was glad to hear the Commissioner speak of ventilation. The Executive Committee had paid great attention to ventilation and heating. The difficulty of the subject justifies asking railroad commissioners to grant time, as railroads are anxious to progress in the right direction. He moved that the various railroad commissioners be requested to grant, as far as possible, sufficient time to railroads to equip their cars in a desirable and satisfactory manner.

Mr. E. CHAMBERLAIN thought railroad commissioners had done this.

Mr. ADAMS supported Mr. Cloud. It is not easy to heat cars, and ventilation was still more difficult and very different to ventilating a house, owing to dust, cinders and varying conditions. On one occasion he found he could heat cars 73 to 75 deg., with ventilators all open, thermometer outside 25 deg. below zero, train of 5 cars. We, therefore, can obtain any amount of heat. The McElroy system did well.

Mr. ROBERT MILLER: Past winter experimented, especially wished to try application of continuous steam heating to Baker system. Had seen McElroy on Delaware & Hudson and was pleased with it; considered it a success. Also used direct steam with McElroy, can use direct and indirect systems in adjoining cars.

Mr. JOSHUA BILLINGS (Pullman Palace Car Co.) said he should have standard coupling. All three systems we have tried are experimental; each had a coupling of their own at starting, but abandoned it. We have best results from Sewall coupler. The standard coupler adopted should be capable of being used with any system of heating, as we do not yet know which is the best.

Mr. CLOUD appreciated the consideration which the New York Commissioners have given to this matter, but offered his motion for all states.

Mr. Cloud's motion was carried.

Mr. SCHROYER used two systems on the Chicago & Northwestern, one direct, which they will continue to use. We want expression of opinion as regards coupler. We want to use the coupler that is most likely to come into general use.

Mr. CONGER (Mechanical Expert Assisting Railroad Commissioner of Michigan) had provided that all heaters after Nov. 1, 1888, must be inclosed in sheet iron casing. If law is strictly carried out Baker heater must be taken out as well as ordinary stoves. In northern part of state we want some auxiliary heaters.

Mr. RICKARD explained that the law was not mandatory, as implied by the report of the Committee, but permitted Railroad Commissioners to extend time if it seemed necessary.

Mr. FORSYTH moved that Committee on Steam Heating be instructed to recommend two couplers for letter ballot, so that one can be chosen as the standard.

Mr. SCHROYER wanted expression now as to coupler Had found Sewall coupler entirely satisfactory.

A member also asked that Association express opinion as to best coupler.

Mr. MARDEN moved that Committee of three name two couplers to be presented for adoption by letter ballot to report this afternoon.

Mr. BILLINGS suggested that one coupler be adopted.

Mr. FRANK SHEPPARD said the Pennsylvania had used several couplings. Wanted one small and reliable; had made several experiments, but results were not entirely satisfactory.

Mr. MARDEN'S motion was withdrawn as not being in accordance with the constitution.

Mr. SCHROYER moved that blue print or model accompany letter ballot.

Mr. Forsyth's motion carried.

Mr. R. C. BLACKALL moved that committee be appointed to report at next convention on loading masts, spars, poles and telegraph poles, and that rules of Grand Trunk Railway be printed in proceedings.

The morning session then closed.

AFTERNOON SESSION, THURSDAY, JUNE 14.

It was unanimously resolved that the election of officers take place to-day.

Mr. CLOUD moved that Mr. E. B. Wall be elected a member of the Executive Committee, in place of Mr. Joseph Wood, who is no longer a representative member.

Carried unanimously.

Mr. FORNEY explained that neither he nor Mr. Blackall, the Chairman of the Committee on Arrangements, could control hotel charges to those not members of the Association.

The Report on Wheels, made by the Joint Committee of the Master Car-Builders' Association, the Master Mechanics' Association and the Wheel-Makers' Association was then read and accepted.

Mr. E. CHAMBERLIN objected that a change of guarantee from time to mileage statement for passenger equipment could not be carried out without consent of general managers.

The President pointed out that the whole report was only recommendatory.

Mr. J. N. BARR thought the tests proposed were not high enough, though 25 blows would better exclude the most dangerous wheels. Two forms of test were in general use: blows on the hub, or blows on the plate. If the former test was used exclusively makers will strengthen the wheel merely to meet the test, leaving the wheel weak and dangerous for actual service. But if the test blows were on the plate, the makers would be obliged to make a wheel that will be stronger in actual service Worn flanges were generally caused by difference in the wearing quality of wheels on the same axle, though sometimes caused by trucks being out of square.

Mr. E. B. WALL considered the matter hardly ripe for submitting to letter ballot, but the Committee should be instructed to inquire whether the recommendations made met with general approval. While there was not sufficient time to hear from wheelmakers at the present meeting, the Executive Committee, recognizing the importance of the subject, would be glad to hear from them afterward.

The Committee on Door Hangers reported and were discharged.

REPORT OF THE COMMITTEE ON STANDARD DOOR HANGINGS, INCLUDING GRAIN DOORS.

Your Committee on Standard Door Hangings would beg leave to submit their report, after addressing circulars containing the following questions to all members of the Association:

1. What kind of side doors and door hangings are you using on freight cars?
2. What grain doors are you using, and are you satisfied with the working of the same?
3. Are you using any patent doors and hangings, and what is your opinion of the same?
4. What is your opinion of a flush door, and what kind have you used?

But 27 replies to this circular have been received, and while a number of roads are using patent doors on a portion of their cars with good results, many are using simply the plain door, sliding on a wrought iron rail.

Various grain doors are in use on different roads, a few using simply plain boards held in place by a rod or nailed. The general opinion seems to be that flush doors would be desirable, but that it would be difficult to obtain satisfactory results from their use, after the cars have been worn, or when affected by wet weather. In view of the comparatively small number of reports received and the diversity of opinion exhibited, as to what doors are most suitable, your Committee can make no recommendation in the direction of arriving at a standard.

(Signed) E. W. GRIEVES,
JOHN P. LEVAN,
JOHN VOORHEES,
Committee.

Mr. J. S. LENTZ moved that the proceedings of the Committee of Arbitration should be printed in the annual report of the Association.

Mr. VERBRYCK thought decisions of the Arbitration Committee were subject to revision by the Executive Committee.

Mr. BARR thought the decisions of Arbitration Committee were only decisive on particular cases before them.

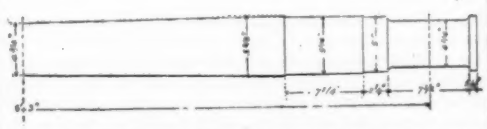
Mr. CLOUD concurred.

The Committee on a Standard Axle for 60,000-lb. cars then reported as follows:

REPORT OF THE COMMITTEE ON STANDARD AXLE FOR 60,000-LB. CAR.

Your Committee recommend for consideration two axles.

1. A collarless axle the same length as the present standard and the same distance to centre of journal, 4¼ × 7⅝ in.; dust guard seat, 5 in. diameter by 2⅝; wheel seat, 5⅝ in.; centre, 4¾ in. The form of bearing and the method of using this axle when worn down is shown on sheet 1.



Axle for 60,000-lb. car, proposed for adoption by letter ballot, Master Car-Builders' Association, 1888.

2. An axle with a collar journal 4¼ × 7½ in. The total length ⅛ in. longer than the present standard axle, namely, 6 ft. 11¾ in.; dust guard seat, 5 in. diameter by 2⅝ in.; wheel seat, 5⅝ in.; centre, 4¾ in.; journal collar, ⅝ in. thick.

This axle, when worn down, can also be used in the present standard journal box, as shown on sheet 2.

Your Committee further recommend that these two axles be submitted for approval as standard by letter ballot.

R. BLACKALL,
R. MCKENNA,
R. MILLER,
J. S. LENTZ,
WM. FORSYTH.

The axles shown in the Committee's report were very similar to those illustrated in the *Railroad Gazette*, June 8. It was finally agreed to submit the axle shown above for adoption by letter ballot. It will be seen that the diameter in the wheel is ⅛ in. less than that recommended by the Committee. The longer journal can be used in the M. C. B. box by using a longer journal brass, the distance from centre to centre of journals remaining unaltered.

Mr. F. D. ADAMS had carried 80,000 lbs. in a car with axles ⅛ in. less in wheel seat and ⅛ in. more in journal than the axle recommended by the Committee.

Mr. J. W. CLOUD thought 5⅛-in. diameter in wheel, 5¼-in. back of axle, and 4⅛ in. instead of 4¾ in. centre would be sufficiently strong. The two axles shown in the report of the Committee are practically identical, only differing as regards the collar. Both should be submitted to letter ballot with the axle proposed last year.

Mr. HARVEY MIDDLETON (Louisville & Nashville), was using 2,000 heavy capacity cars carrying iron ore, coal, etc. The axles were 5¼ in. diameter in the wheels, 4⅛ in. centre, and the journals were 8 in. × 4 in. This increase of bearing surface in the journals had given excellent results, abolishing hot boxes, though the same oil and waste are used.

Mr. F. D. ADAMS objected to the proposed axle, as he had a large number of axles in use and had no trouble with hot boxes. He would rather have a thing too strong than not strong enough, and though sizes might be correct by calculation, cars were often overloaded. The journal would wear, and the wheel seat, notwithstanding rules, would be skimmed up every time a fresh wheel was put on, reducing the size and strength below that on which the calculation was based.

Mr. SCHROYER pointed out that the proposed axle can be used in the M. C. B. box, but one with an 8-in. journal could not. It would be useful if the proposed 60,000-lb. axle could be used under 40,000-lb. cars.

Mr. W. FORSYTH said that any calculation as to the strength of axles must be uncertain, because all calculation must be based on a safe working load, the proper amount of which was a matter of opinion. The present M. C. B. axle is properly proportioned for a 40,000-lb. car, and if its strength was proportionately increased, we arrived at the diameters given in the axles proposed by the Committee.

Mr. CLOUD assumed that the M. C. B. axle was strong enough for a 50,000-lb. car.

Mr. W. FORSYTH thought it was not safe for a car of that capacity.

Mr. H. MIDDLETON had found brasses crushed under a load of from 90,000 to 70,000 lbs., but the axles were all right, not bent or sprung.

Mr. JOHN MACKENZIE thought collarless journal ought to have bearing central. At present is 4⅛ in. long on one side of the centre, and 3⅛ in. on the other.

Mr. H. MIDDLETON used his large axle in the M. C. B. box. He had reduced the dust-guard bearing to 2 in. wide, and so maintained the present centres 6 ft. 3 in., lengthening the journal 1 in. and shortening the dust guard bearing ⅛ in.

Mr. F. D. ADAMS moved that the axles shown on the drawing accompanying the report of the Committee be put to letter ballot.

Mr. SCHROYER asked if any one had used collarless journals for freight service? We ought to take an axle which we know can be used, and not adopt an untried axle as standard. A journal 4¼ × 8 in. was a proper size for 60,000-lb. cars, and would run better than a 4 in. journal, which was not enough.

Mr. F. D. ADAMS pointed out that a collarless journal could not be used on a diamond truck, as the side thrust came entirely on one side of the truck and one set of arch bars was not sufficiently strong laterally to carry the whole side thrust of an axle.

Mr. SCHROYER moved that the axle with collar journal as recommended by the Committee be altered, wheel seat being made 5¼ in. instead of 5⅝ in diameter, and a corresponding change made in the diameter back of wheel, and that this amended axle be submitted for adoption by letter ballot.

Mr. E. B. WALL moved as amendment to above to couple with it axle submitted last year to letter ballot, as many cars had that axle, which had given good service.

Another member urged that axle submitted last year to letter ballot should be included.

Mr. SCHROYER said his officers wanted an axle which could be used when worn under 40,000-lb. cars. Last year it had not been duly considered.

Mr. WALL wanted to test the feeling in favor of a large axle.

Mr. ADAMS thought that the requisite two-thirds majority could not be secured if more than one axle was submitted to letter ballot.

Mr. Wall's motion was lost, but the vote was reconsidered by 35 to 12.

Mr. SCHROYER'S original motion to submit the No. 2 or collar journal axle with his modifications was then brought forward.

Mr. Wall's amendment to couple with it the axle proposed last year was then put and lost by 19 to 25.

Mr. Schroyer's motion was carried by 31 to 1.

The report of the Executive Committee on Freight Car Drawbars was read and received.

THE REPORT OF THE EXECUTIVE COMMITTEE ON AUTOMATIC FREIGHT CAR COUPLERS.

At the last convention you decided to submit to letter ballot the report of the Executive Committee, recommending the adoption of the Janney type of coupler, as the standard of this Association. The letter ballot resulted in the adoption of the recommendation by a vote of 474 in favor, against 109, and the Janney coupler became the M. C. B. type.

With the adoption of the type and the report, the duty de-

voloped upon the Executive Committee, of establishing the contour lines of this type and the preparation of drawings and templets which would definitely determine and exhibit the standard of the Association.

Independently of the subject of automatic car couplers, which was specially given to the Executive Committee for investigation, the Executive Committee is charged by the constitution of the Association with the duty of considering any recommendations made to this Association, involving the use of patented devices.

While pursuing their inquiry into the contour lines of the M. B. C. type, it was discovered that Eli H. Janney, of Alexandria, Va., had been granted letters patent of the United States, No. 212,703, Feb. 5, 1879, that in their 8th and 9th claims related to the contour lines of the M. C. B. type of coupler. The Executive Committee, acting in accordance with the constitution, took the ground that they could not establish the lines of the M. C. B. type unless all patents upon them were waived. This the owners of the patents referred to consented to do, in the following letter:

OFFICE OF THE JANNEY CAR COUPLING CO., ALEXANDRIA, Va.

Edw. B. Wall, Esq., Chairman Sub-Committee of the Executive Committee, M. C. B. Association, Columbus, O.

DEAR SIR—In the event of the adoption by the M. C. B. Association of the contour lines of the faces of the Janney car coupler as the representative lines of the M. C. B. type, the Janney Car Coupling Co. agrees to waive all claims for patent on contour lines of coupling faces of car couplers used on railroads members of the M. C. B. Association.

The formal papers conveying this waiver to be made by the Janney Car Coupling Co. to the general counsel of the Eastern and Western Railroad Associations. Yours respectfully.

E. H. JANNEY,
President Janney C. C. Co.
WM. MCCONWAY.
W. H. BARNUM,
President Janney-Hein Coupler Co.

Your Committee considered it advisable to have the waiver executed to the railroad companies through the Eastern and the Western Railroad Associations, whose function it is to deal with legal questions relating to patents.

A form of agreement was prepared by these associations in which it is stipulated that the Janney Car Coupling Company agrees to give all railroad companies which are members of these associations or are represented in the M. C. B. Association the right to use the patents referred to in their letter.

Agreements in accordance with this form will be made with each railroad company upon giving notice to the vice-president of the Janney-Hein Coupler Company. Under these agreements the right to use the contour lines is not only conveyed to the railroad companies, but to the manufacturers of couplers of the M. C. B. type, when manufacturing couplers for the railroad companies, members of the M. C. B. Association, or the Eastern or Western Association.

Copy of the Agreement.—Whereas, The Master Car-Builders of the United States and the Dominion of Canada, by their authorized representative, the Master Car-Builders' Association, have adopted as a standard and have recommended the use of what is known as the "Janney type" of coupler, and now called the "M. C. B. type," for freight cars; and

Whereas, Said coupler embodies in its construction certain contour lines which are described and form the subject of the eighth and ninth claims of letters patent of the United States, No. 212,703, granted to Eli H. Janney, of Alexandria, Va., Feb. 5, 1879; and

Whereas, The whole of the right, title and interest in and to the said letters patent, No. 212,703, is now vested in the Janney Car Coupling Co., of Alexandria, Va., the McConway & Torley Co., of Pittsburgh, Pa., and the Janney-Hein Car Coupler Co., of Lime Rock, Conn., the said three companies being the sole and exclusive owners thereof; and

Whereas, The rail company named below has adopted or decided to adopt the said type of coupler, with the said contour lines, as the standard couplers for freight cars, and has in writing notified Wm. McConway, Vice-President Janney-Hein Coupler Co., or his successor, thereof, evidence of which notice is appended hereto:

Now, *Therefore*, in consideration of the premises and of the adoption by the Rail Co. of the said type of coupler and the said contour lines as its standard for freight car couplers, and in consideration of the payment of one dollar, the receipt of which is hereby acknowledged, we do hereby grant and convey to the said railroad company, its successors and assigns, the right to make and use, or cause to be made for its own use, freight car couplers containing the contour lines as covered by the eighth and ninth claims of the said patent on all freight car couplers now or hereafter owned by it on any or all roads now or hereafter owned, operated or controlled by it, and the right to use, repair and replace freight car couplers containing the said lines, on cars belonging to other parties that may run over said road or any part thereof, as fully and freely as we might do the same by virtue of said letters patent for the term or terms for which said letters patent are or may be granted.

It is mutually understood and agreed that this contract and license does not relate to and shall not be construed as a license or a release under any other claim of said letters patent 212,703, or any other letters patent now or hereafter owned by us or either of us.

This instrument is executed and deposited in escrow with the ——— of the association, it being understood and agreed that if said railroad company shall adopt or decide to adopt the said type of coupler as aforesaid, and shall make application for such license to make and use freight car couplers containing the contour lines referred to, and shall give notice thereof to William McConway, Vice-President Janney-Hein Coupler Co., or his successor, then the said William McConway, Vice-President aforesaid, shall notify the said ——— of the association of the receipt thereof, and thereupon this instrument shall be delivered, and upon such delivery it shall remain in full force and effect, but otherwise it shall be of no force and effect as against said licensors.

In witness whereof, the said Janney Car Coupling Co., the McConway & Torley Co. and the Janney-Hein Coupler Co. have caused these presents to be signed by their respective presidents and their corporate seals to be thereto affixed, this day of April, A. D., 1888.

Your Committee in proceeding under the adopted recommendation of the report, "That the Association procure one of the present make of Janney coupler, selection being made by a committee for that purpose, and that all other forms of couplers that will automatically couple to and with this coupler, under all conditions of service, are to be considered as within the Janney type and conforming to the standard of the Association," ascertained the exact contour lines of the coupling faces of the Janney coupler. They also ascertained the contour lines of the other makes of couplers within the Janney type, as they considered that they would be serving the best interests of the Association by determining wherein the Janney lines could be improved without altering the character of the type or interfering with the interchangeability established by the adoption of the report.

After a full and careful investigation they decided that they could not recommend to the Association any material departure from the Janney line, as in the opinion of the Committee the principle of contact of the surfaces of vertical cylinders embodied in the Janney coupler affords the best connection for cars upon curves and tangents.

Your Committee, found, however, that it would be advantageous to introduce slightly more clearance for the knuckles when two couplers were coupled together, to allow for the variation in manufacture of the different couplers within the type, at the various manufactories throughout the country.

Before publishing the contour lines, your Committee had some couplers manufactured with this additional clearance, which were tried on tangents and curves, with themselves and with old and new Janney couplers. They were found to couple with complete satisfaction.

The standard of the Association is, therefore, with the publication of these lines, definitely fixed, and it is in the power of any inventor or manufacturer of couplers, now or hereafter, to determine for himself whether his coupler will automatically couple to and with this standard, under all conditions of service.

The railroad companies can, with equal facility, make this test with any coupler brought to their attention. Your Committee feel that the members of the Association will be impressed with the desirability of making the test before they adopt any particular make of coupler, to the end that absolute interchangeability will be secured.

To reap the full benefit of the adoption of a standard type of coupler, the Association should take advantage of the opportunity to establish, in addition to the contour lines, other such forms and dimensions of the coupler as would contribute to the interchange of cars, making it possible to substitute in repairs, not only a coupler whose contour lines will couple with all other couplers within the type, but which will take the place of the vacated coupler, without alterations to the car.

Your Committee was so impressed with the necessity of uniformity in these essentials that, through a special committee, they issued a circular of inquiry to members of the Association, dated Jan. 20, 1888. This circular was issued to ascertain the views of the members on the main dimensions of draw-head desirable, its location under the car, and the size of dead-blocks needed, and it contains the recommendations of this special committee upon these same points.

Some sixty answers received thereto showed that forty-five were in favor of the recommendations of the special committee, twelve were in favor of the same with slight modifications in some of the figures, while three were not in favor. As these replies were largely from representative members, the Executive Committee decided to include these details in their announcement of the contour lines issued by the Secretary on April, 1888, together with some other details in regard to the necessary clearance of the drawhead under the stirrup. They also stated that they would submit these recommendations to the Association as standards.

These recommendations fix the main dimensions of the drawhead and its location with respect to the end sill and prescribe the clearance in the stirrup. They also change the length of the deadwood block from the present standard to 9 in., and they stipulate that the bearing from the draft pin head shall be 2 in. from the back end of the drawhead. The Committee therefore now recommends that these dimensions be considered by the convention and be referred to the Association for adoption by letter ballot. In submitting this report of the development to date of this very important subject, your Committee feel that the Association and the railroads of the country are to be congratulated on the great advance that has been made by the adoption of a type of coupler with contour lines prescribed, as invention can now be directed to improvements in detailed mechanism; in strengthening parts; and devising means for the protection of the couplers against the shocks and strains of service.

If the Association adopts the recommendations of the Committee as submitted above, interchangeability will be secured, but not otherwise.

The attention of car-builders, coupler manufacturers and inventors, is invited to the invention of an efficient buffer.

Mr. RANKIN (Philadelphia & Reading): His road voted last year in favor of the Janney type, but now found it inapplicable to some of their stock.

Mr. SCHROYER objected to length of bar (30 in.), though approved of it otherwise. Did not see any adequate reason for so small change as proposed.

Mr. ROBT. MILLER supported Mr. Schroyer, as he had many M. C. B. draw-bars.

Mr. MACKENZIE thought it would fit the M. C. B. draft timbers.

Mr. SCHROYER objected because cars would be too far apart.

Mr. ADAMS objected to length.

Mr. WALL asked why Mr. Adams had not brought forward this point in Executive Committee.

Mr. SCHROYER moved that bar be reduced to 28 in., the length followed for many years.

Mr. CLOUD explained that length was increased because it would be used in new cars, and attachments could be made to agree with M. C. B. coupler. As projecting end weighs something, it is very advisable to have shank long.

Mr. SCHROYER thought 2 in. not enough to make a difference. The M. C. B. coupler ought to be used on all cars, as it could not be run with common draw-bars.

Mr. SCHROYER'S motion was carried.

Mr. RANKIN moved that Association defer final action until next year.

Mr. CLOUD agreed, though he considered such a motion was entirely unnecessary.

Mr. B. K. VERBRYCK opposed, as it would be a step backward, and would cover the Association with ridicule.

Mr. J. W. MARDEN was in favor of a uniform draw-bar, but was not satisfied with the M. C. B. draw-bar, which cannot be applied to all old equipment, and will not long be a standard.

Mr. SCHROYER said his officers would have used 5,000 M. C. B. couplers if the Association would take definite action. Objected to further delay, which would only benefit some inventor whose success was wholly prospective. Would be ashamed to return home and meet his general officers if Association adopted Mr. Rankin's motion.

Mr. WALL said type and lines were firmly settled; the only thing remaining was to settle some less important details, such as the length, 30 in. or 28 in., as suggested by Mr. Schroyer.

Mr. J. N. BARR indorsed Mr. Schroyer and said that if the Association was not ready to go ahead the general managers would go ahead for us.

Mr. C. C. BLACKALL only objected to alteration of previously established length of draw-bar.

Mr. GEO. HACKNEY had the M. C. B. coupler on 500 cars and has contracted for it on 3,000 cars, and would be very sorry if there was any further delay.

Mr. CLOUD explained that a standard uncoupling arrangement, etc., could not be settled this year.

Mr. JOHN KIRBY had voted for M. C. B. coupler because he didn't want to stand in the way of the wish of the majority. The draw-bar should be 30 in. long to work properly.

Mr. MACKENZIE had contracted for 30 in. bars, which would go into M. C. B. draw timbers. The extra length did not separate cars further, but brought them nearer together by close coupling, though bumpers stood out further.

Mr. RANKIN'S motion lost.

Mr. FORSYTH moved that recommendation of 28 in. and 30 in. be both submitted to letter ballot.

Mr. SCHROYER explained that the adoption of a longer draw-bar would make his cars further apart.

Mr. MACKENZIE explained that distance between cars when *stretched* was not increased. Those who used 30-in. bars would vote for that length. In any case deadwoods had to be changed.

Mr. SCHROYER had 26,000 cars to which the M. C. B. coupler would have to be applied within as short a period as possible, but it could not be done if the standard was changed to 30 in.

Mr. MACKENZIE moved that the length of the bar be 30 in.

The motion was put, the votes being 21 to 21, a tie. The motion was, however, carried by the casting vote of the President.

Mr. FORSYTH moved that the recommendations of the Committee be submitted to letter ballot for adoption as a standard. Carried.

Mr. CLOUD called for a vote by cars on adoption of axle, but withdrew after some discussion.

Mr. WALL wanted to show how far car coupler question had gone. The Association of General Managers in Chicago, in November, 1887, appointed a committee to adopt one draw-bar for all roads centring in Chicago, and appointed a conference with the sub-committee of the Executive Committee. A resolution was proposed by Mr. Jeffrey, of the Illinois Central, that the vertical plane type of coupler be adopted, and that it conform with the requirements of the M. C. B. Association. Any coupler used should couple with the M. C. B. type, as this body cannot recommend any individual coupler.

It is advisable that the Master Car-Builders' Association stand firmly to their action, and decide on details for carry irons, etc.

The election of officers then took place, and the following gentlemen were declared elected:

OFFICERS, 1888-9.

President—William McWood (Grand Trunk).

Vice-Presidents—J. W. Cloud (New York, Lake Erie & Western), E. W. Grieves (Baltimore & Ohio); John S. Lentz (Lehigh Valley).

Treasurer—John Kirby (Lake Shore & Michigan Southern).

Executive Members—*R. C. Blackall (Delaware & Hudson), *R. D. Wade (Richmond & Danville), *E. B. Wall (Pittsburgh, Cincinnati & St. Louis), †J. W. Marden (Fitchburg), †W. Forsyth (Chicago, Burlington & Quincy), †T. A. Bissell (Wagner Sleeping Car Co.).

The above constitute the Executive Committee.

The PRESIDENT returned thanks for re-election, and said he fully appreciated the high honor conferred on him.

Mr. MARDEN returned thanks for his election to the Executive Committee, and said he would endeavor to do his best for the Association.

A vote was then taken on the place for the next annual meeting in June, 1889. A committee will select one of the three places obtaining the highest number of votes. The voting was as follows:

Lake George, 24 votes; Saratoga, 19; Niagara Falls, 19; New York, 3; Cleveland, 1; Denver, 11; Pittsburgh, 2.

The Convention then adjourned.

EXHIBITS.

In addition to the exhibits shown last week, as detailed in the *Railroad Gazette* of June 15, the following have arrived:

The Pacific Lock & Seal Co., of St. Louis, show their improved freight car seal and record and extension hook. The glass seal and record form a perfect detective arrangement and prevention of theft, while the extension hook, which entirely does away with the common hasp and staple, is readily set to either hold the door tight shut or to hold it ajar for ventilation. The same company show their car end-door fastener, which takes up all the slack and cannot be unfastened from the ontside.

The Adams & Westlake Co., of Chicago, show the Hitchcock chair, which embraces a new feature in chair construction, the frame being entirely of brass, while the upholstery is very luxurious. They also show their white metal car trimmings.

The Moffat improved closet for coaches is exhibited by Messrs. F. B. Jones and J. L. Thurber, of Chicago.

The Ashton Valve Co., of Boston, show an Ashton composition incased valve for locomotives, also one locomotive cam lever valve.

The Scarritt Furniture Co., of St. Louis, represented by their manager, S. G. Scarritt, show handsome upholstered seats and car chairs of various designs, among them being the Forney seat, which has been changed since its first appearance on the market. Mr. Scarritt also shows some beautifully finished parlor car chairs which are used by about twenty of the larger roads.

D. Goff & Sons, Pawtucket, R. I., show a variety of colors in their car seat plush.

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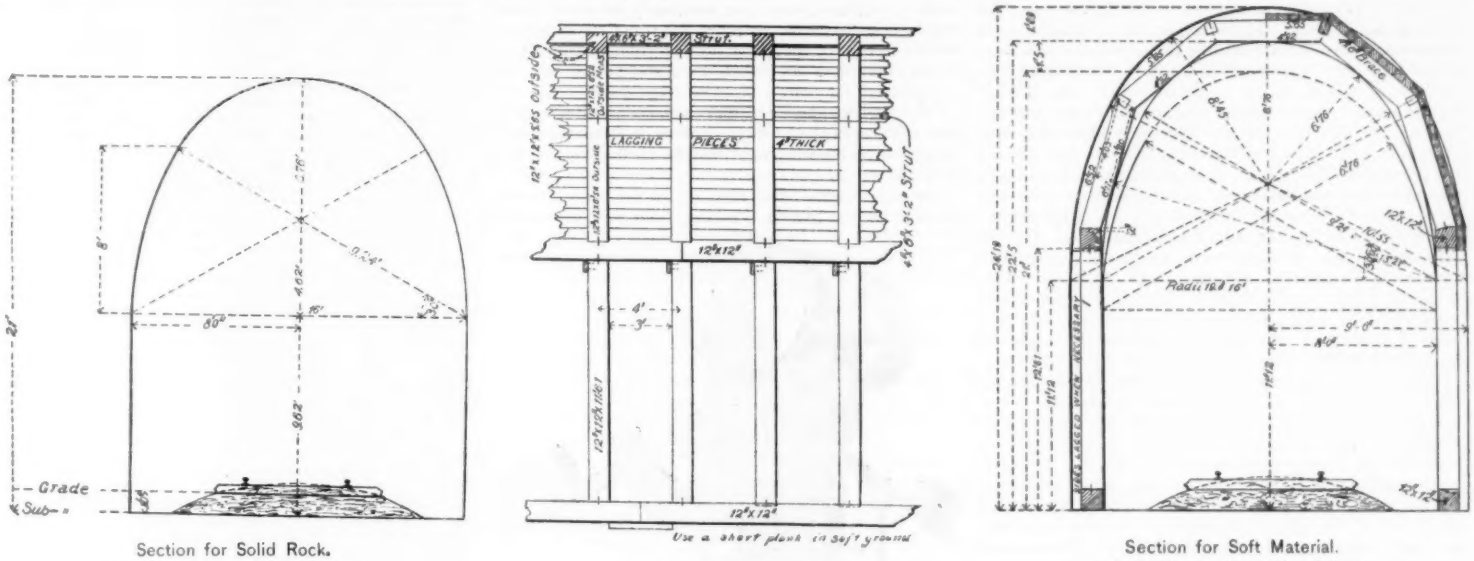
* Term of office expires June, 1889.
† Term of office expires June, 1890.



Section for Solid Rock.
11.07 cubic yards per lineal foot.

Section for Soft Material.
15.21 cubic yards per lineal foot.

STANDARD SECTIONS FOR WICKES TUNNEL, MONTANA CENTRAL RAILWAY.

The Johnson Electric Service Co., of Milwaukee, show the Johnson system for regulating heat in railroad cars; also the steam heating system as used on the Chicago, Milwaukee & St. Paul with the Gibbs coupler.

E. C. Bartlett, of Omaha, shows his patent automatic combined freight car fastener and seal.

The Deoxidized Metal Co.'s exhibit of metal bearings and car furnishings has received marked attention.

The United States Metallic Packing Co. show samples of their manufactures.

F. Crossier, Columbus, O., shows a patent tube expander.

Merrill Bros., Brooklyn, N. Y., show their turn buckle.

The Cleveland City Forge & Iron Co. show samples of their well-known turn buckles.

Manning, Maxwell & Moore exhibit Richardson's patent muffler and locomotive valve; also Smith's portable rail saw.

The McGuire Manufacturing Co., of Chicago, show their grain door.

The Wakefield Rattan Co., of Boston, show samples of the Henry car seat.

The Mason Regulator Co., of Boston, show their reducing valve for steam heating.

Joyce, Cridland & Co., of Dayton, O., show samples of their jacks and vises.

Capt. J. C. Barber, master car-builder of the Northern Pacific, shows a handsome model of his car truck.

The Non-Magnetic Watch Co. exhibit handsome specimens of their watches. They also have running a miniature dynamo to prove the non-magnetism of their watches.

The McElroy Car Heating Co., of Detroit, exhibit their steam car heating coupler and improved trap.

The Graydon Safety Car Heating Co., Indianapolis, show their improved automatic coupler, together with drawings of their heating system.

Armour & Osterhoudt, of New York, show samples of their railroad signal lanterns.

The Globe Ventilator Co., of Troy, N. Y., exhibit models of their new ventilator.

Harrison Loring, of Boston, exhibits the Jewett truck of 80,000 lbs. capacity, with the Loring bolster and Vose graduated spring. This truck is also equipped with the Marden patent brake beam.

The Fowler Steel Car Wheel Co., of Chicago, exhibits a 33-in. wheel just as it came from the rolls. This wheel is made from the highest grade of open-hearth steel, which, while being rolled into the finished wheel is subjected to a condensing pressure of not less than 2,000 tons. Since Jan. 1, 1888, about 100 wheels have been placed in service on the following roads: Burlington, Cedar Rapids & Northern, Boston & Albany, Boston & Maine, Chicago, Burlington & Quincy, Chicago, Milwaukee & St. Paul, and Chicago & Alton.

The Detroit Lubricator Co. show their sight-feed lubricators, together with samples of packing as used by them.

The Otley Manufacturing Co., of Chicago, show their Eureka steam packing cement.

The National Paint Works, of Williamsport, Pa., exhibit sample of Elliott asphaltum paint.

The Star Machine Co., of Buffalo, N. Y., show their Star Cyclone blower and portable bellows forge.

F. B. Westbrook, of Port Jervis, N. Y., shows his metallic packing.

The Westinghouse Air Brake Co. show the new engineer's valve, the triple valve and the new air pump governor.

The Feed-Water Heater Co., of St. Johnsbury, Vt., show model of their feed-water heater.

The Eames Vacuum Brake Co. show a model of brake rigging for a six-wheel truck.

The Coup Car Coupler may be classed as indefinable and belonging to no type known to civilized man. It consists of a vertical hook, a chain pulley, a shaft and wiper, two nails, and other parts too numerous to particularize.

The McElroy heater was exhibited.

The Hale & Kilburn Co. showed several specimens of their seats.

The Wakefield Rattan Co. also exhibited several seats.

The McGuire Mfg. Co. showed a grain door.

The Wickes Tunnel.

By the Wickes Tunnel the Montana Central pierces the divide between the Boulder and Prickly Pear valleys, on the Helena-Butte line, at an altitude of about 5,450 ft. above the sea. The elevation of the summit at this point is about 6,200 ft. The tunnel is to be 6,120 ft. long. Last August we republished (from the *Journal of the Association of Engineering Societies*) a description of a plan proposed by Col. J. T. Dodge for driving this tunnel by bottom headings, the full width of the tunnel, and say, 8 ft. high. His problem was to complete the tunnel in fourteen months. Unfortunately the material is such as to require arching all the way, and Col. Dodge's method was not attempted. Nevertheless, the progress for some months has averaged 422 ft. a month, as follows: November, 406 ft.; December, 465 ft.; February, 334 ft.; March, 417 ft.; April, 387 ft.; May, 476 ft. At this rate the tunnel may be completed in 14½ months.

We give herewith the standard sections and timbering for this tunnel. Full dimensions are given in the drawings, and it only remains to add that the bents are spaced 4 ft. between centres, and that there are 345 ft. B. M. of timber when only the arch is lagged, and 438 when the lagging extends all around the section.

The Montana Central has lately completed the Woodville and the Boulder tunnels also.

The Woodville tunnel was finished about April 1. It is 1,280 ft. long, and was driven by hand in nine months. The tunnel was in granite, and one-half its length required arching.

The Boulder tunnel, 802 ft. long, was completed in April. This tunnel is in granite formation, full of talc seams, and was arched its entire length.

American Association of Railway Chemists—Cleveland Meeting.

The fourth regular meeting of this association was recently held at Cleveland, O. The following railroads were represented at this meeting: Union Pacific, by H. B. Hodges, Chemist and Engineer of Tests; New York, Lake Erie & Western, by W. D. Gregory, Chemist; Chicago, Burlington & Quincy, by W. L. Brown, Chemist, and G. H. Ellis, Assistant Chemist; Chicago & Northwestern, by G. M. Davidson, Chemist and Engineer of Tests; Baltimore & Ohio, by R. H. Barrett, Chemist; New York & New England, by P. H. Conradson, Chemist; Lehigh Valley, by C. P. Coleman, Chemist. In addition to these, the Atchison, Topeka & Santa Fe, and the Chicago, Milwaukee & St. Paul are represented in the Association.

Since the last meeting at Omaha in October, 1887, two new railroad chemical laboratories have been established, viz., those of the New York & New England and the Lehigh Valley. The total mileage of the railroads who now have fully equipped chemical laboratories is more than one-fifth the total railroad mileage of the United States.

The newly elected officers of the association are: W. D. Gregory, President; W. L. Brown, Vice-President, and G. M. Davidson, Secretary and Treasurer.

The chief subject selected for discussion at the Cleveland meeting was "Oils for Railroad Use." Invitations were extended to oil experts, chemists and all interested in the subject from a technical standpoint to be present at the open sessions and join in the discussion. Among those who accepted this invitation were J. E. Denton, of Stevens Institute, Hoboken, N. J., who has charge of the tests and experiments carried on by the Lubricating Committee of the Standard Oil Co., at New York; Mr. E. H. Stanly, of the Summit City Oil Co., Akron, O.; Mr. H. W. Mather, of the Cleveland Grease & Oil Co.; Mr. H. L. Hollis, Chemist of North Chicago Rolling Mill Co.; Mr. C. A. Marshall, Engineer of Tests of Cambria Iron Co.; Mr. O. Textor, Chemist of Cleveland Rolling Mill Co.; Mr. W. E. Mullins, Chemist of the Eclipse Lubricating Oil Co., Franklin, Pa.; Mr. W. W. Doschiel, of Swan & Finch, New York; Mr. Thomas Owen, Chemist, London, Eng.; Dr. Percy Neyman, Chemist Sherwin-Williams Co., Cleveland; Mr. W. Nye, Analytical Chemist, Cleveland: Mr. J. C. Skinner, of Union Acid Co., Cleveland, and others.

LUBRICATING OILS.

The subject taken up at the first open session was lubricating oils. The testing of black mineral oils such as are used for the lubrication of car journals and machinery was thoroughly discussed. These oils are extensively used by railroads, and are known under different names by various roads. Some call them "black oils," others "well oils," and again others "petroleum stock oils." The lubricating quality of these oils varies very much, and railroads have found it necessary to issue specifications, and to carefully test each shipment. Up to the present time there has been no uniformity in these specifications, nor in the methods used in testing the oils and much confusion and trouble has arisen.

Fire Tests.—To show the extent of the variation that exists, figures were quoted from the specifications issued by railroad companies for the same kind of oil which show that in making the fire test of this oil some roads specify that the rate of heating shall be 7 degrees per minute, and others that it shall be 5, 15 or 20 degrees per minute. Two specify that the test flame shall first be applied at 200 degrees Fahr. One specifies it shall be first applied at 193, and another at 222 degrees Fahr. Some apply the test flame every 3 degrees, some every 5 degrees, and some every 7 degrees. In testing cylinder oils the rate of heating is 10, 15, and 20 degrees, according to the different railroad specifications. The temperature at which the test flame shall first be applied is 200, 380, 396, 400, and 425 degrees, as stated in the different specifications, and the intervals 5, 7 and 10 degrees. In order to obtain uniform results in testing these oils it is necessary to use uniform methods.

After much discussion in regard to the influence of the various methods of testing these oils it was decided that mineral lubricating oils be divided into two classes with reference to their fire test. That oils burning below 400 degrees F. be heated in an open vessel at the rate of 10 degrees per minute, the test flame to be first applied 50 degrees below the specified flashing point and applied once every 5 degrees until the burning point is reached. For oils burning above 400 degrees F. the heating to be at the rate of 15 degrees F. per minute, applying the test flame 50 degrees below the specified flashing point, and applying it once every 5 degrees until the burning point is reached. It was also decided in making this test to use the open cup tester known as the Cleveland cup. A committee was appointed to procure and send to each laboratory represented in the association a drawing showing the shape and size of this cup.

Cold Test.—The methods used for determining the cold test of oils were discussed at length. The cold test is quite an important factor in deciding upon the suitability of an oil for outdoor use in winter. An oil may be first-class in all other respects and yet have so poor a cold test that it would not do the work required of it when subjected to severe cold weather. At the Omaha meeting of the Association in October, 1887, a committee was appointed to investigate the subject of the cold test of such oils as railroads use. This committee reported that they had found so great a difference of opinion among various chemists and oil experts upon the subject of cold test that they would not recommend the adoption of a standard method until more data could be obtained.

Letters were read in regard to this subject from Mr. Silas H. Paine, Manager of the Lubricating Oil Department of the Standard Oil Co., New York; Mr. S. C. Lewis, Manager of the Eclipse Lubricating Oil Co., Franklin, Pa.; Mr. F. W. Arvine, Chemist Lombard Ayers & Co., New York; Dr. Chas. B. Dudley, Chemist P. R. R., Altoona, Pa.; Mr. O. B. Steele, Manager of the Relief Oil Works, Franklin, Pa., and Swan & Finch, oil dealers, New York. Much discussion followed, and many instances of the value of the cold test of oils which have come under the personal observation of the chemists were mentioned. On account of the difference of opinions in regard to the best method it was decided not to take any final action at the present time but to continue the subject so the members might have time to collect further information.

Viscosity.—The subject of viscosity of oils was next introduced. This subject has during recent years received considerable attention, and many tests have been made which indicate that viscosity and lubricating quality are closely allied in oils. One prominent oil expert present stated that he considered the viscosity test as one of the most important in judging of the value of oil for the lubrication of cars and loco-

motives. Leaving out gravity, he said that nearly every property of lubricating oil was represented by viscosity. The body of an oil, or its power of keeping surfaces apart under certain conditions of temperature, etc., determine to a large extent its value as a lubricant under those conditions. This property of oil is shown by the viscosity test. An instance was mentioned where a certain grade of oil used for lubricating the slides of a heavy engine had been condemned as poor oil. It was said to be poor because it lathered and covered the slides with black foam. Upon examination it was found that this lather was due to small particles of brass which had been worn off. A number of oils were tried on this engine, and it was found that some oils formed lather on the slide and some did not. When these oils were tested it was found that the oils low in viscosity were the ones that lathered, while the oils high in viscosity were apparently all right. [The reader will find in the *Railroad Gazette* of May 11 an abstract of a valuable paper on the subject of Viscosity Determinations, by Professor Denton.—EDITOR.]

Valve and Cylinder Oils.—The discussion of oils used for the lubrication of valves and cylinders was taken up. These are generally mixtures of high fire-test mineral oils with animal oils, the latter being added to increase the adhesiveness of the oil to heated and moist iron surfaces. The composition of many of the valve and cylinder oils in the market and also those made by the railroad companies was considered. When railroads use a quantity of this kind of oil they find that it pays to purchase the oils unmixed and compound them themselves.

The corrosive action of free acid upon the metal composing the valves and cylinders was mentioned, and instances were cited, that had been observed by those present, where valves and cylinders had been badly corroded by the use of oil containing free acid. One instance was mentioned where in one month an engine cylinder had been honeycombed by the use of a lubricant containing free acid. One case was mentioned where a railroad had tried to use mineral oil alone for the lubrication of locomotive cylinders and found that it did not give satisfaction. On stationary engines mineral oil alone has given good results.

Mechanical Tests, etc.—The mechanical tests for lubricating oils were discussed and photographs of brasses showing the effect of the use of various oils and greases upon them were exhibited. In regard to the use of grease for journal lubrication the general opinion of those present was that for new brasses grease could be used with good advantage, but that after the brasses had become worn a little and fitted to the journal that oil was preferable.

The discussion of thermometers and hydrometers, the errors of same and method of correcting, the specific gravity, ash test, tar test, loss test and service tests complete the list of subjects discussed under the head of lubricating oils.

ILLUMINATING OILS.

The discussion of illuminating oils was then taken up. Previous to the meeting of the Association at Buffalo, in May, 1887, the testing of illuminating oils by the railroads represented was practically in the same state that the testing of mineral lubricating oils is to-day. Each road had its own kind of instrument and its own method of making the test. In some cases this was very different from the tests made by the oil companies, and many disputes between the railroads and the manufacturers arose in regard to the test of oils which were largely due to the use of different instruments and different methods. In order to avoid these disputes and have some uniform method and instrument the Association voted at the Buffalo meeting to adopt as the standard instrument for determining the flash test of mineral illuminating oil the Elloit closed cup. The wisdom of this decision was plainly shown by the testimony of the members after one year's trial. Not only have the railroads during this time secured a better and more uniform grade of oil, but the disputes in regard to the test of the oil, which formerly were of frequent occurence, are now very rare.

The photometric tests and lamp and lantern tests were mentioned and special apparatus devised by one of the members for testing the illuminating quality of oil was exhibited. The composition of mineral illuminating oils, that is the proportion of heavy and light oils in them, the color, cold test and gravity test were briefly discussed. Instances were mentioned which had been brought to the attention of some of the chemists present where lamps had refused to burn or had produced only a dim light and complaint had been made that the oil was poor quality. When these complaints were followed up it was often found that dirty water in the lamps or wicks clogged with dirt or oil of another grade, for which a different kind of wick and burner was required, and in one case lubricating oil in the lamp was the cause of the trouble.

Samples of crude petroleum from the Shoshone oil regions of Wyoming Territory were exhibited and figures were quoted giving the per cent. of lubricating oil, burning oil, light hydrocarbons and tar found in same by an analysis made in one of the railway laboratories.

The tests for the purity and quality of the animal oils, generally used by railroads, were discussed and the composition and test of signal oils also received quite a little attention.

The next meeting of the Association will be held at Baltimore next October, at which meeting the chief subjects selected for discussion are "Water Supply and Purification" and "Cleaning of Passenger Equipment."

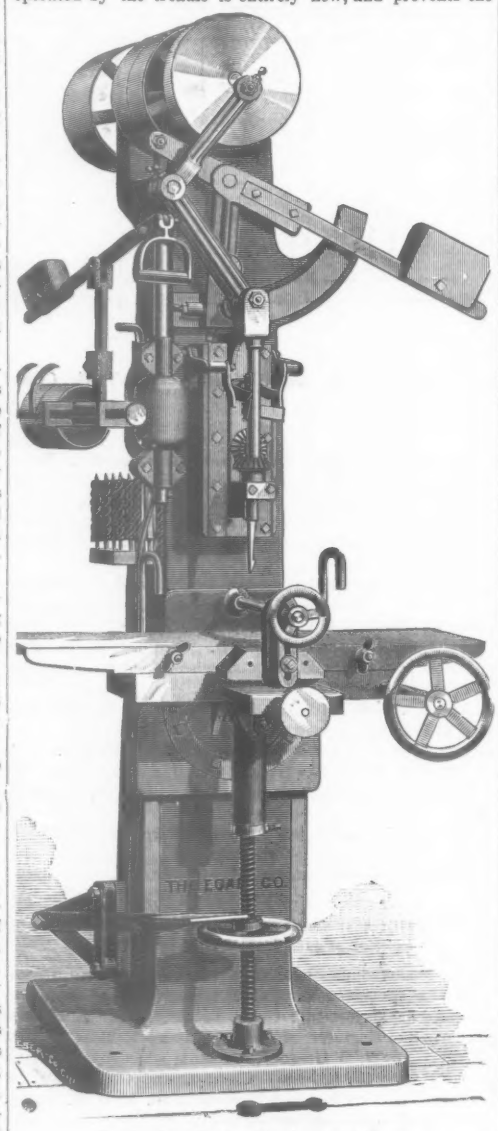
Graduating Stroke Mortiser and Borer.

We illustrate herewith a new graduating stroke mortiser and borer, designed for rapid and accurate work in hard or soft wood. It possesses advantages which make it a desirable machine for car works and railroad shops.

The column is cast hollow and in one piece, with the loose and tight pulleys running between large journals. All the working parts are planed true, accurately fitted and gibbed, making it impossible to get out of line; and the makers say that on account of the special style of graduated stroke, and the way it is fitted and planed, it will stand up to any kind of hard work for years without needing repairs.

The chisel mandrel is of cast steel, connected to one solid ram, working in planed ways, making it impossible for the mandrel to spring when mortising the hardest kind of wood at the full stroke.

The patent radial slide attached to the connections and operated by the treadle is entirely new, and prevents the



Graduating Stroke Mortiser and Borer.
Made by THE EGAN COMPANY, *Cincinnati, O.*

slightest jar on the foot, adding to the speed and to the comfort of the operator.

The patent reverse, which is a very ingenious device, is perfectly automatic, and is controlled by the treadle and chisel mandrel, reversing the chisel only when the treadle is released. This is said to be the most perfect self-reverse ever put on this style of heavy mortiser.

The bed is compound for mortising all kinds of angle and straight work, and has an adjustable nut and clamp screw for clamping wide or narrow stuff, and is supplied with hooks for holding the stuff to the bed. The upper part of the bed works in planed ways, operated by a hand wheel, rack and pinion. When mortising, the bed is raised and lowered by a right and left hand screw, to suit the thickness of stock and the depth of mortise wanted.

The boring mandrel is connected to the machine and furnished with a suitable lever and belt shifter to operate it. An adjustable gauge-stop is also supplied to gauge the depth of boring to suit the chisel.

For further information and prices address the Egan Company, 202 to 222 W. Front street, Cincinnati, O.

The Master Mechanics' Convention of 1888.

The Convention was called to order by President Setchel on Tuesday morning, June 19. Prayer was offered by the Rev. C. T. Evans, and the Rev. E. H. Kenyon made an address of welcome.

The President then read his annual address. In the course of it he said:

This is our twenty-first anniversary. To-day we are of age, and may fairly be expected to take upon ourselves all the obligations of mechanical citizenship. At this annual meeting we ought to be able to consider the important questions that may come before us in such an intelligent, practical manner, as to make the work of this convention one that all will acknowledge as being for the best interest of railway service. For 20 years we have been considering the important mechanical problems pertaining to railroad management, and our discussions and the results of our deliberations have been published and distributed to the public, and this forms the basis of the technical knowledge that to-day makes it possible to operate the mechanical department of railroads at less than one-third the cost of 20 years ago. But notwithstanding the fact that much has been done and very many improvements made as the direct result of the investigations of this Association, there yet remains much more to be accomplished. We have sometimes been found fault with because we have done so little in the way of adopting association standards. A few words of explanation in regard to standards may not be amiss at this time. The Association has adopted some valuable standards which largely govern master mechanics in their practice in constructing the details of locomotives to which they refer, and it is a source of gratification that where this has been done in no case have more recent investigations made it necessary for the Association to reverse its action, thus showing that subjects were well considered, and that there really was no good objection that could be brought against their use. It is a legitimate object of the Association to give expression to a preference for certain materials or for certain methods of construction, as indicating what is regarded by the majority as the best practice; but unless standards can be adopted with the firm conviction that they are the best, the survival of the fittest, as it were, it may well be questioned whether it is not better to first perfect our mechanical knowledge by a comparison of views by free open discussion than to attempt to decide questions not yet fully developed and that do not receive the full indorsement of the Convention, or to do what is still less to be commended in members to favor and vote for a standard in Convention, but fail entirely to carry it out in their practice. Take as an illustration the standard driving wheel centre, one of the most useful and reasonable standards of the Association, adopted after very careful consideration by a unanimous vote, and yet it is a fact that locomotives are being constantly constructed with wheel centres within a quarter of an inch of these sizes, this shows how averse we are to yielding our own preconceived opinions even in the face of the acknowledgment that the standard is a good one and ought to be maintained, and it also shows that it will not be until a stronger conviction of its importance is realized by the members. We should adopt standards only as fast as we become educated up to what we require. It is easy to design an engine with all its parts properly proportioned to haul a train of a specified weight, say forty miles an hour, and that the best mechanics would pronounce practically perfect, but how long would this practically perfect machine be allowed to do the work for which it was designed and in doing which there would be left a margin of power and a margin of safety in its working parts? It would be no longer than the time when there would be another car awaiting transportation, and another and still another is added until some part of the engine under the strain of this added load gives away, then the disproportioning of parts commences. If the crank pin breaks, the size of the pin is at once increased, then the rods fail and they are made stronger, next the axle is found light and the size of the driving axle is increased, and now the driving wheel and crank pin hub, weakened by being bored out for the increased size of axle and pin, succumb to the inevitable, and about this time the conclusion is reached that the engine is too light for the service, and a new design for an engine for this hard service is in order. The parts that failed in the old engine are made very much stronger in the new, and others that perhaps on account of being better material have stood the strain of hard work are left the same to give out at some future time. These are some of the difficulties that stand in the way of a standard construction.

Our newly elected Secretary deserves our hearty congratulations for the very satisfactory manner in which his duties have been performed the past year. The report came out early and with some improved features that merit your approbation. The work during the year has been well kept up and faithfully performed, and it is to be hoped that circumstances may be such that the services of Mr. Sinclair may be continued indefinitely.

TUESDAY MORNING.

The roll of members having been called, the Secretary read his report, which stated that the increase in membership was satisfactory and that nearly 1,200 copies of the annual report have been distributed. The Association has $6,200 invested in 4 per cent. U. S. bonds. The report of the Treasurer was read and an auditing committee appointed. A committee was also appointed to collect dues.

The report of the Committee on the Proportion of Boilers to Cylinders and Driving Wheels, was then presented.

REPORT OF THE COMMITTEE ON BOILER PROPORTIONS.

The total heating surface of a boiler should be governed by the horse-power developed when the engine is exerting its maximum continuous effort. To obtain the most economical results, boilers cannot be designed to suit the many various conditions of service and character of fuel, by any hard and fixed rule. For average practice, with bituminous coal, where steam passages are ample, your Committee recommends that 2 sq. ft. of heating surface be provided for each horse-power developed, when engine is exerting its maximum continuous effort. To arrive at such maximum horse-power, it is suggested that for ordinary passenger and freight engines, a piston speed of 800 ft. per minute, in connection with 40 per cent. of boiler steam pressure, be assumed; and upon this assumption the following formulæ are submitted:

A. Area of one cylinder in inches multiplied by 5.2 equals total heating surface.

B. Total heating surface divided by 11 equals fire-box heating surface.

C. Total heating surface divided by 70 equals grate area.

D. Total heating surface divided by 400 equals flue area.

It appears that the grate area is capable of a wider range in dimensions than other parts of the boiler, and by making this abnormally large, as in the case of the "Wootten" and other kindred boilers, grades of fuel, otherwise of little use, can be successfully burned. With the same size of cylinder, a switching engine requires less heating surface than a road engine, the difference depending upon the special requirements in each case; but the same rule may be applied, viz., to provide 2 ft. of heating surface for each horse power developed during maximum continuous effort. Your Committee considers that the recent progressive steps in boiler proportions noticeable in all parts of the country are largely due to the untiring exertions of your Secretary, through the columns of his well-known paper and information received from him. Mr. J. Davis Barnett and Mr. D. H. Neale have very materially assisted your Committee in the preparation of the above report. The dimensions and proportions given here apply only to engines with 24-in. stroke.

CHARLES BLACKWELL,
CLEM HACKNEY,
JOHN MCGRAYEL, } Committee.

Supplementary.

Chicago, Burlington & Quincy Railroad Co., Office Superintendent Motive Power,
AURORA, Ill., June 7, 1888.

Mr. Charles Blackwell.

DEAR SIR: In reply to the circular of the Master Mechan-

ical Association on the proportions of cylinders and driving wheels to boilers, we do not follow any fixed rule, but keep within certain limits which successful practice indicates. We find that boilers of good design for bituminous coal have for their proportions the following ratios:

	Max.	Min.	Averages.
A. Grate to heating surface	1:45	1:70	1:60
B. Tube area to grate	1:7	1:5	1:6
C. Heating surface in sq. ft. to total cyl. capacity in cu. in. 3 per cent. added clearance	1:8	1:10	1:9
Taking into account the dia. of wheel we have, with 85 per cent. boiler pressure as mean effective pressure.			
D. The ratio of heating surface in sq. ft. to tractive force:			
Passenger	10:1	12:1	11½
Freight	13:1	18:1	15
Passenger.			
C., B. & Q.: A.	1:60	B. 1:6	C. 1:9 D. 1:11
Average as above	1:60	1:6	1:9 1:11
15 by 22.			
Fast pass. eng., 139 68-in. W.	1:55	1:7	1:9 1:11
17 by 24 A. 69-in. W.	1:70	1:5.6	1:9 1:10
18 by 24 A. 69-in. W.	1:70	1:5.6	1:10 1:11
Class H. new 68-in. W.	1:61	1:5.9	1:9.26 1:11.85
Freight.			
Average for good engines	1:45	1:8	1:9 1:15
Old class D, 20 by 24 52-in.	1:46	1:8.38	1:12 1:18.3
New class D, 20 by 24 52-in.	1:44.8	1:8.5	1:9.94 1:15.7
Switchers.			
Class E, 16 by 22 52-in.	1:75.5	1:5.5	1:10 1:15.45
Class G, 18 by 24 52-in.	1:76.7	1:4.8	1:10.78 1:16.5

GENERAL AVERAGES.

Ratios.	Passenger.	Freight.	Shifting.
Heating surface, square feet, to tractive power, pounds	1:11.5	1:15	1:16
Grate to heating surface	1:60	1:45	1:70
Tube area to grate	1:6	1:8	1:5

Taking now the first case mentioned in the circular, the tractive force with mean effective pressure equal to 85 per cent. of boiler pressure, is 17,300 lbs. Taking from our table the ratio of heating surface to tractive power, 1:11.5, we then have:

1st. Passenger $\frac{17,300}{11.5} = 1,500$ sq. ft. heating surface.

$\frac{1,500}{60} = 25$ " grate surface.

$\frac{25}{6} = 4.16$ " tube area.

2d. Freight $\frac{26,200}{15} = 1,750$ " heating surface.

$\frac{1,750}{45} = 38.8$ " grate surface.

$\frac{38.8}{8} = 4.85$ " tube area.

3d. Shifter $\frac{21,580}{16} = 1,350$ " heating surface.

$\frac{1,350}{70} = 19.3$ " grate surface.

$\frac{19.3}{5} = 3.8$ " tube area.

In using 160 lbs. pressure instead of 140, as has been the practice, about 14 per cent. more heat is absorbed by the steam and that much more heating surface must be provided.

Yours truly,

(Signed) GODFREY W. RHODES, Supt. M. P.
WILLIAM FORSYTH, Mech. Eng.

The report was received.

Mr. BLACKWELL (Central of Georgia), said the Committee did not wish formula given to be considered as hard and fast rule, they were merely good average proportions.

Mr. J. DAVIS BARNETT (Grand Trunk) said there were serious discrepancies about advertised performance of locomotives. There should be some proportion of boiler to hauling power. One well-known firm of builders gave the number of tons which their engines could haul on the level, and an examination of their figures regarding seven classes of engines gave the following results:

Class of engine.	Sq. ft. heating per ton. Weight hauled on level.
Passenger	slightly over 1.00
Passenger	1.57
Mogul	1.27
American type, freight	1.15
Mogul	2.17
Switcher	2.05

This shows necessity of some formulæ for establishing relation between tractive force and one horse-power. Thought Committee's formula fairly representative of average practice here.

In some cases, however, the maximum horse-power is developed when locomotive is going down grade. Proportions should be based on results when engine was ascending grade.

Mr. FORNEY thought subject had been unnecessarily complicated. He had found that boiler could not be made too large. The size of wheels should be proportioned for service, and the size of cylinder to the weight on the wheels in the manner suggested by the Committee last year. You can then get the weight of frames, wheels, cylinders, etc., and then make boiler weigh the rest of the total weight of the engine. The size of grate was dependent on the quality of fuel. Within limits of weight and space, to which you are confined, heating and grate surface cannot be too big.

Mr. A. SINCLAIR agreed with Mr. Forney, but engines had generally to be designed with a view of minimum weight and medium size of cylinders, which are generally too large for heating surface. The recommendations of Committee would support master mechanics in urging the use of large boilers on the superior officers of their roads.

Mr. W. FORSYTH (Chicago, Burlington & Quincy) said term heating surface was used in different ways. Relative values of tube and fire-box heating surface in locomotive boilers should be determined.

Mr. HICKEY asked if Mr. Forney would advocate enlargement of fire-box without limit. Agreed with Mr. Forsyth. Is increase of flue surface necessary or should diameter or number be increased?

Mr. FORNEY: Capacity of boiler can only be increased by increasing diameter, as length is fixed by other considerations. Broadly speaking, boilers are never too large, their size being limited by total weight of engine and width of gauge; would adopt type which was lightest and increased diameter. Many kinds of crown bars and braces involved great weight.

Mr. SPRAGUE (H. K. Porter & Co.) said if diameter of flues was increased the length should also be increased.

Mr. FORNEY pointed out that friction in a long small tube was excessive.

Mr. JOHN MACKENZIE (New York, Chicago & St. Louis, "Nickel Plate") had found 2-in. flues do better than 2¼ when 13 ft. 1¼ in. long, both having ⅝ in. clearance.

Mr. HICKEY (Milwaukee, Lake Shore & Western) had two similar classes of engines; one having tubes 1 ft. shorter steamed more freely. Within limits, the length of tubes was not important.

Mr. SINCLAIR: D. K. Clark found that great extension of fire-box surface did not add to efficiency of engine, but that proportions of flues were important.

The consideration of questions was then in order.

Mr. R. H. BRIGGS asked "What influence has the height of the boiler on the wear of truck and driving boxes?" He thought with a high boiler the oscillation was largely taken up by the springs, and that the height of the boiler had little or no influence on the lateral wear of the boxes.

Mr. MACKENZIE had trouble with his engines leaving the track at one particular point, and considered that new engines should have more lateral motion than is usually allowed.

Mr. FORNEY thought height of boiler beyond control.

The Association then proceeded to the questions of rigid or swing beam trucks for ten wheel engines, in connection with plain or flanged tires on front drivers.

Mr. BRIGGS had found plain tires do best.

Mr. HEWETT preferred rigid truck and blind tires in front for ten-wheel engines, but preferred moguls to ten-wheelers.

Mr. JACOB JOHANN thought swing motion trucks detrimental on both 10 and 8-wheel engines. If the road is crooked, the engine is swinging constantly, wearing flanges of front drivers. Engines are generally put up too rigid and tight. Found forward drivers did best when not flanged. Had changed blind tires from middle to forward drivers. Made truck centre oval, giving 1¼ in. play. Height of centre of gravity of boiler had no influence on curving.

Mr. MACKENZIE preferred swing motion trucks for long wheelbase engine.

Mr. SPRAGUE had found it necessary to add rollers to swing motion trucks.

Question then proposed, "Can crown bars be dispensed with?"

Mr. ROBERTSON (Vermont Central) found replacing crown bars expensive, and asked if stays were safe.

Mr. PECK (Western Indiana Belt) found radial stays ran clearer and longer than crown bars. Safe with 160-lbs. pressure.

Mr. SPRAGUE thought stays safe beyond question.

Mr. J. BOONE (West Shore) had used radial stays for crown sheets with very satisfactory results. Scale does not deposit thick enough to cause a leak. The crown was rounded to nearly half a circle.

A committee was appointed to consider application of Mr. D. L. Barnes for Associate Membership.

The Secretary stated that he had endeavored to enable members' wives and friends to attend convention at reduced fares, but was unsuccessful.

Report of Committee on Extension Smoke Boxes and Fire-box Brick Arches was then read:

REPORT ON EXTENSION FRONTS AND BRICK AND OTHER FIRE-BOX ARCHES.

Economy in the use of coal used for generating steam is a matter of great and growing importance. Recent estimates have shown that over 150,000,000 tons annually, all over the world, is used for making steam. A low estimate of value of this coal at place of use would be an average of $2.50 per ton, which gives us the present annual expenditure for steam the sum of $375,000,000, from which it will be seen how largely even a small per cent. of saving would add to the wealth of the world. While mechanics and manufacturers have given much consideration and care to the improvement of the steam engine, whereby they might reduce the consumption of steam for a given amount of power, but comparatively little attention has been given to securing economy in its generation. It would trouble us very much, and we should take the earliest opportunity of having it corrected, were it plain that through imperfect machinery our engines were wasteful of steam, yet strangely we remain to some extent indifferent regarding appliances necessary to extracting the full heating value of the fuel for its formation. We know scientifically that the compounds of carbon require certain quantities of air to effect perfect combustion, yet we are not particular about ascertaining what quantities are supplied, or under what conditions, and often treat the matter as though no such combination was necessary.

The committee received fifteen replies, which contain much valuable information, which we hope to publish at a future issue. The conclusions and recommendations of the committee are as follows:

The heating value or combustible matter of different coals vary so greatly that it is impracticable to lay down a fixed rule giving the proper proportions of locomotive furnaces, their fixtures and conditions, or any set dimensions of smoke-box that would be successful for all kinds of bituminous coal. A furnace with its attachments, and having a certain grate area and heating surface admirably suited to one kind of coal and practically giving good results, would perhaps, and often is, a partial failure with coal of another quality. Unsatisfactory results from the fire-box are often followed by condemnation of the smoke-box or its character, whether the latter is at fault or not; and it is plain that any changes made in the smoke-box or stack, when the fault is with the fire-box or its parts, cannot be productive of good results. The character and heating quality of fuel used on any road being determined by a few carefully conducted experiments, the parts for its economical use can be proportioned as far as practicable. If it is desired to test the efficiency of a furnace and its attachments, it should not be forgotten that the amount of coal burned is always an uncertain element, and a proper test is to base the efficiency on the actual combustible matter present in the coal. When the question is of the efficiency of the coal, then the evaporation should be based on the total amount burned and no allowance made for non-combustible. In all cases, the rate of combustion, that is, the amount of coal burned per square foot of grate per hour, should be carefully noted. If experiments are made, designed to reach the ends named, great care and ripe reasoning should be used in reaching conclusions, as often the smallest matters may change the course of important results, and thus lead to wrong impressions. As an instance, the writer, on one occasion, while conducting some experiments in an extended smoke-box of a locomotive, was, after certain changes, much disappointed in not getting expected results; in fact, any change made, no matter how radical, fell short of those expected. Were it not that a former experience, under the same general conditions, had performed differently, the matter would have been given up as a failure; but perseverance discovered the cause, which proved to be a leaky joint at the base of the exhaust pipe, and blowing forcibly towards the flue-sheet when the engine was working. This affair, though small, interfered much with the action produced by the exhaust, and on being corrected, the expected results were obtained. The fact of having no standard established basis or formula recognized by the Association for the purpose of conducting such experiments as would lead to the economical use of locomotive fuel has often led to imperfect tests, and consequent false and conflicting conclusions. In the opinion of your Committee the foregoing are some of the chief reasons that have caused the great diversity of opinion among Master Mechanics regarding the important subject under consideration.

Extensions.—Due consideration of the information received from practical Master Mechanics and Superintendents of Motive Power in different parts of the country, together with the experience of your Committee, prepares them to say that as spark arresters, and consequent safeguard against fire, cleanliness to trains and economy of maintenance, when properly constructed and within certain proportions, the extension fronts and open stacks are decided improvements in locomotives designed to burn the average quality of bituminous coal. Your Committee regrets that no reliable statistics are at hand comparing its performance with the old style construction as a fuel economizer, but is forcibly impressed with the opinion that with a stack constructed on the ejector principle, or any principle tending to produce the most complete and uniform vacuum in smoke-box, it has also considerable merit in the direction named. Now, while the inside arrangement and their relative positions have much influence on the fire, any economy of fuel is not directly due to the extension itself; it comes from the increased area of exhaust nozzle, which is always permissible when the product of the exhaust has a free and unimpeded outward passage. The additional cost of construction, the slight increased weight thrown upon the truck, and the more trivial objection that the construction interferes with the process of washing boilers from the front end, are of minor importance, and deserve but little consideration if it is established that such departure from the the old style serves any useful purpose and accomplishes any valuable result.

The volume of the smoke-box need not be dependent on accommodating the accumulation of a round trip; a receptacle for cinders attached to the extension, with a pipe leading to a point within a few inches of the track, the outlet governed by a valve handled from the engine cab, the accumulation would be under the control of the engineer, and could be disposed of at will.

From experiments made by your Committee with extension smoke-boxes of a greater and lesser volume, the relative dimensions given in the foregoing general dimensions of locomotive experimented on, were found to be productive of best results.

Of appliances in the ordinary old style smoke-box designed to accomplish the results obtained from well-proportioned extensions, your Committee is unable to speak, having had no experience or data from which to base conclusions further than the statements of gentlemen embodied in the report.

Brick Arches.—The use of a brick arch in the furnace of a locomotive designed to burn bituminous coal under ordinary circumstances, is productive of good results. Its position in the fire-box delays to some extent the currents and gases after leaving the fire, and largely assists their chemical combination and consequent combustion before entering the tubes. Brick a few inches thicker than those in general use would be better suited for this purpose. The change would not only add to its serviceable period, but would be placing at a proper point a body of material capable of being highly heated, storing to some extent the energy of the fire-box, and adding to the number of heat units therein contained. It also has the effect of promoting a higher and more uniform temperature, thus increasing the efficiency of the fire-box, as is attested by the reduced amount of black smoke produced, and without a corresponding reduction of temperature, a result that cannot be obtained under circumstances of a rapid rate of combustion in a furnace not so equipped.

Injuries to fire-box sheets, arising from the use of the brick arch, have occurred only where it has been the cause of unequal expansion of such sheets, and this could only be possible under circumstances where the brick arch is set close to or resting solid against them. In all cases there should be a space of one inch or more between side sheets of the fire-box and brick, and not less than two inches between the tube sheets and the latter. By this means a free circulation of uniform temperature is permitted in contact with one side of the sheets of the furnace, and with a free and *necessarily unimpeded* circulation of water on the other, the danger of any injury to fire-box, resulting from the use of the brick arch, is entirely removed. If the brick arch had no other features to commend it than its influence in maintaining a more uniform fire-box temperature, and lessening the formation of smoke, it is worthy of the most earnest consideration. The assertion that its first cost and maintenance will not repay the advantages derived, should be based alike on its fuel-saving qualities, the reduced injury to passenger-car paint, and the value of largely abating a great public nuisance.

Hollow Stay Bolts.—The quantity of air to be admitted above the fire by means of hollow stay bolts or otherwise, and the best relative position for its admission, should be determined by careful experiment. If it is desired to admit air over the fire, care should be taken that it is permitted to enter the furnace as near the fire line as possible, so that it may mingle with the gases as soon as possible after they are evolved from the coal. Air for purposes of combustion, however, taken in through the grate bars serves a much better purpose, and it is always a source of loss if a sufficient

supply cannot be taken in at that point. Its passage through the under portions of the fire not only prepares it to more readily mingle with the gases on its arrival at the surface, but, having absorbed a certain amount of dormant heat, and places it in active operation, assists to a great extent in maintaining a more elevated temperature than if the same amount was taken in at any point above the fire.

The good or bad features of admitting air above the fire is somewhat in the dark, not having been practically determined by experiment. It is a matter of great importance, however, and is entitled to much more consideration than it generally receives.

Firing.—Careful, regular and intelligent firing is the only way by which a right supply of air can be introduced to mix with and consume the gases, and no matter how efficient a furnace and details may be for the proper combustion of fuel, its ultimate success depends on the care and intelligence used in firing.

Extremely thin fires have been warmly advocated as producing the best results. While your Committee are in favor of a moderately thin depth of fire, they cannot from experience advocate a fire so thin that it will admit large and bulky volumes of cold air, thereby reducing, for a moment at least, the temperature of the fire-box to such a degree as will not permit a combustion of the gases. The fire contains a certain number of units of heat; if twice the amount of coal was in active combustion there would be double the number of heat units, and in consequence could more easily sustain a reduction of temperature following a fresh charge of coal, and by that means sustain a more uniform temperature, a situation of things that is always desirable.

All matters said and done relating to the economical use of coal on locomotives will be fruitless of good results if the enginemen are ignorant of the simple rules of combustion and careless about educating themselves in this necessary branch of their calling. Enginemen showing a disposition of carelessness in the use of coal, or in any way ignoring the principles governing its economical use, are as much unfitted to have charge of a locomotive as if such ignorance and carelessness was shown towards the rules governing the operation of trains.

The following rule, issued by a Western company, illustrates our remarks:

"It is a common practice for some firemen to throw a large amount of coal into the furnace at one firing: in this case the coal being thick on the fire, it cuts off the air supply that should come through the grates; in consequence the coal on top is rapidly coked by the heat underneath, and the gas and smoke (the very cream of the coal) escape unconsumed. An equal amount of coal placed in the furnace in three or four firings instead of one would in many instances evaporate more water and reduce very much the amount of black smoke."

Furnace.—The function of a furnace designed to generate steam is to produce the largest percentage of heat from a given weight of fuel and with the greatest possible elevation of temperature of the products of combustion and to transmit to the water the largest possible amount of heat thus produced. Any amount of air admitted to the furnace in excess of that necessary for proper combustion is a detriment and a loss, as it not only takes out through the smoke-stack a certain quantity of heat that otherwise would be utilized in making steam, but it diminishes the temperature of the furnace, thereby impairing its efficiency as a heat producer.

On the other hand every pound of fuel requires a given quantity of air for its complete combustion, and must find it at a certain high temperature or the effect will be lost. The amount of air required varies with the extent of gaseous matter in the coal, but in every case less air than is required by the fuel prevents complete combustion, and an excess of air causes a waste of heat, experiments having determined that the relative heating values of the gas and fixed carbon contained in the average quality of bituminous coal is as 14 to 16 when expressed in amounts of water that each would evaporate. Nearly one-half of the steaming value of the coal it will be seen is contained in volatile gases, and requires different treatment to that of the fixed carbon for their complete combustion. It seems not difficult to construct a furnace or arrange its attachments for coal, such as anthracite having a single combustible element to deal with, but with bituminous coal we have the gaseous matter and the carbon to operate; a furnace properly adapted to work the gases will not be found equally efficient with carbon, and conversely, a furnace efficient to deal with the carbon will not produce the best of results in combustion of gases.

Rate of Combustion.—The velocity of draft and rate of combustion are some of the most important elements pertaining to the consumption of coal. To the rapidity of combustion in locomotive fire-boxes is due, perhaps, more waste of fuel than from any other source. It appears from experience to be impossible to extract from the coal its full heating value when the rate of combustion exceeds ninety pounds per square foot of grate surface per hour, and far more economical results were obtained when the rate was much less than the figures named. In order to utilize to the best advantage, therefore, the material necessary to the formation of steam, that is to say, the air and the fuel, the fire should not be forced, but an augmented grate area with a correspondingly increased furnace, are the necessary substitutes. The superiority from an economical point of view, of slow over rapid combustion, has repeatedly been shown by experiment. One case coming under the direct observation of your committee, where, with a forced fire in order to get the engine to produce sufficient steam for her work, the evaporation was only 4½ to 5 lbs of water per pound of coal, whereas with an increase of 20 per cent. in furnace and grate surfaces to the same cylinder, and performing similar service the evaporation rose to 6 lbs.

Smoke.—Smoke is also a product of incomplete combustion, the entire prevention of which under circumstances of a rapid rate of combustion is attended with great practical difficulties, in fact under such circumstances it seems impossible to accomplish. It has been proven beyond question that smoke once formed cannot be consumed. What is then needed, therefore, is not a smoke-consuming but a smoke-preventing furnace.

Every act leading to the proper combustion of coal takes place with increased ease, facility and completeness, as the force of the draught is lessened within certain limits; as the temperature in the furnace is more elevated and uniform; as the charges of fresh fuel are lighter and more regular; as the correct amount of air is admitted at the proper time and as the contact is more intimate between the air and fuel.

The great variety of kinds of fuel, although containing nearly the same ingredients but in many different proportions, it is true, renders it a difficult task to arrange mechanically the means of utilizing all to the best advantage; but lack of appreciation of the above-mentioned facts, and of interest of the principles involved, is chargeable much waste of money, confusion of ideas and disappointments.

Committee: { JOHN HICKEY, W. A. FOSTER, E. L. WEISGERBER.

The convention then adjourned till Wednesday morning.

WEDNESDAY MORNING SESSION.

Extension Fronts.—The subject of extension fronts was discussed by Messrs. MacKenzie, Hickey, Sinclair and others, and it was stated that a smoke-box, nozzle and stack, formed like the vacuum ejector, a central nozzle and a contracted funnel, gave good results in creating a strong draft or vacuum with the smallest possible amount of back pressure. Mr. Jacob Johann, however, dissented from this view.

Mr. GIBBS (Richmond & Danville) had not obtained good results with coned stacks until nozzle was lowered to centre of boiler and increased ¼ in. diameter. Had tried telescopic nozzle, but found that it did not do so well, especially when made low.

Mr. BOON (West Shore) had found stacks tapered from 14 in. to 18 in. in 2 ft. and 16 in. at top made steam well with larger nozzle, and found generally that the smaller the stack, the larger the blast nozzle could be made. Contracting the stack had improved the steaming in every instance. Had altered from two 2⅞ in. nozzles to two 3⅛ in. nozzles.

Mr. LAUDER (Old Colony) said he was much in favor of extension smoke-arch, and straight stacks invariably improved steaming. We use single nozzle. While consumption of fuel was not affected, single 5 in. nozzle would suffice for 17 and 18 in. cylinder engines and did not lift fire or throw sparks. Nozzles were often too high. Netting and nozzle could be lowered with good results, top of nozzles being level with top of flues. Straight stack as good as vena contracta, and he preferred 17 in. stack after making experiments. Height and location of nozzle were more important than form of stack. Brick arch should be used to diminish sparks and smoke. He had found tubes supporting the arch burn out. These tubes ought to project 2 in. into water space so as to get a solid supply of water instead of steam. First tubes secured by sleeve nut broke in two years, at the root of thread, lower end of tube. Now he skimmed flue, slipped sleeve on, then bent flue and screwed up nut. This plan was cheap and stood well, avoiding cutting of thread on tube.

Mr. W. FORSYTH (Chicago, Burlington & Quincy) had made some experiments with annular nozzle blast pipes, which gave good results.

Mr. JOHANN had used brick arches in 1860, but thought their disadvantages outweighed their advantages.

Mr. GENTRY (Richmond & Danville) found brick arches prevented smoke and sparks. Supported arch on three or four thick hydraulic tubes which did not crack, and lasted two or three years, gradually burning out. Brick arch properly applied could not help giving satisfaction. It always improved steaming qualities, even with diamond stacks. The increased cleanliness had diminished expense of painting cars, and fires along lines. Did not make arch touch sides and sheets, and cleaned top of arch regularly. Used arch on all engines.

Mr. BOON had found brick arch increased mileage per ton of Ohio coal 7 miles, with more uniform steaming and fewer cinders. Engine showed no smoke unless worked very hard. Use brick arch on all passenger engines on West Shore.

Mr. HICKEY (Milwaukee, Lake Shore & Western) had never found fire-box sheets injured by brick arch. Experiments showed evaporation of 5½ lbs. without arch, and 6.3 lbs. of water per lb. of coal with arch.

Mr. SHAVER (Pennsylvania) left 1½ in. on sides and 3 in. at ends, between arch and sheets. This prevented burning and improved steaming.

Mr. SWANSTON placed arches on angle irons. When the rise exceeded the thickness, arches gave us no trouble. Had found that supporting tubes filled up with deposits, and therefore abandoned them for angle iron support.

Several members used arches with considerable spring, supported on lugs screwed into sheets, which gave no trouble.

Mr. GENTRY had arches which had been running 8 years.

Mr. ORTTON stated that water table used on New York Central prevented smoke.

Mr. G. W. STEVENS (Lake Shore & Michigan Southern) read figures giving results of experiments:

	Evaporation per lb of coal.
Straight stack	5.71 lbs.
Diamond stack	5.71 "
Straight stack and extension front	5.80 "
" " " " brick arch	7 03 "

Mr. STEVENS moved that brick arch applied in fire-box is a desirable addition to locomotives for any kind of service.

Mr. SINCLAIR narrated early history of brick arch, invented by Thomas Yarrow, Locomotive Superintendent of the Scottish Northeastern about 1850. He was satisfied that the more the brick arch was used, the more it would be liked. Supporting tubes did useful work.

Mr. SHAVER (Pennsylvania) said tubes never burnt out unless circulation was stopped by waste, etc.

A member said that if four large bricks were used tubes were unnecessary.

Mr. O. E. STEWART (Fitchburg) used twelve 12 in. × 6 in. bricks in 78 in. box, in no place closer than 3 in. to sheets.

Mr. PECK (Western Indiana) placed his brick arch 25 in. from fire door and 16 or 18 in. from the crown sheet, and 3 in from flue and side sheets. Arch rested on angle irons, no tubes being used.

Mr. SWANSTON rested brick arch 4 in. thick on angle irons inside groove in brick arch, which stood well.

Mr. MACKENZIE used bricks 7 in. thick, but it was difficult to thoroughly burn bricks of this great thickness.

Mr. STEVENS' motion was carried unanimously. Many members, however, did not vote.

Hollow Stay Bolts.—The value of hollow stay bolts was then discussed. Mr. Ortton thought them valueless, and believed in a thin fire and admission of air below the fire. Mr. Sinclair preferred deflector inside fire door because admission of air by hollow stay bolts could not be regulated. Mr. Clare (Wisconsin Central) thought air admitted over fire was best preventive of smoke. Mr. Swanston used four or five 2-in. hollow stay bolts each side. Careful experiments had shown value of hollow stay bolt in lessening smoke.

Mr. GENTRY did not doubt this, but had found that no saving of fuel was caused by hollow stay bolts.

Mr. L. AMES (Beech Creek) found hollow stay bolts, six a side in large consolidation engines, did well, increased steaming capacity, and lessened smoke and cinders. Left 3 in. opening in bottom of smoke-box, and cinders fell through on track. Used extension front to lead sparks into hopper.

Mr. G. W. STEVENS believed in hollow stay bolts with small holes.

Mr. SINCLAIR pointed out that number of heat units in fire depended rather on quantity in state of combustion than on quantity in grate.

Mr. HICKEY contended that a moderately thick fire is better than a very thin one.

The Report of the Committee on Crossheads and Guides was then read.

REPORT OF THE COMMITTEE ON CROSS HEADS AND GUIDES

The favorite form of crossheads and guide for locomotives in the United States seemed, a few years ago, to have been settled by a process of natural selection. The four-bar form of guide was seen upon nearly every locomotive which would permit of its application. This, no doubt, was due to the fact that for many years there was scarcely any type of locomotive to be seen in this country (with the exception of comparatively few "ten-wheelers") but the so-called "American type," and this, as well as the ten-wheeler, permitted the four-bar guide to be employed. It probably owes its popularity either to accident, or to the fact that it is necessitated by the most obvious form of crosshead.

However this may be, it received something of a shock upon the appearance of the Mogul and Consolidation locomotives, to which it could not be applied without introducing some obviously very bad constructive features. It received a positive set-back when the Pennsylvania Railroad adopted, some six or seven years ago, the two-bar form for all of its classes of locomotives. Since then the well-known Laird guide has been somewhat applied to the American type of engine, and its good qualities should commend it to the attention of master mechanics. There are still other forms, one or two of which deserve attention.

It is the purpose of this report to consider the functions of a crosshead and guide, to examine the well-known forms, to weigh their advantages and disadvantages, and to recommend for adoption that form which fulfills its objects most perfectly. The Committee has departed from the customary method of sending circulars to each member of the Association, requesting him to state his practice, because nothing, in the judgment of the Committee, is to be gained in this way.

Every well-informed master mechanic is familiar with American practice in these devices, and his attention is invited to them.

In all, except oscillating and trunk engines, a crosshead is needed to join the piston rod to the connecting rod, and in order to prevent this crosshead from being displaced by an inclined connecting rod, or other cause, it must be held in such a way than it is free to move back and forth in the direction of the length of the piston rod, but in general, in no other direction. In some modern short connected marine engines, having long gearings, there is nothing to prevent side motion of the cross-head because there is nothing to cause it, but in a locomotive such construction could not of course, be employed.

The friction of a sliding block has always been an objection to a crosshead moving in a guide, and consequently much ingenuity was exercised by early engineers, from James Watt downward, in devising jointed systems of links, known by the general name of "parallel motions," for constraining the crosshead to move in a straight line, thus substituting pin friction for flat surface friction. No such device could conveniently be attached to a locomotive, and probably no one made the attempt. They have been very successfully applied to vertical stationary beam engines, but now-a-days the tendency seems to be in all countries to return to the sliding crosshead and guide.

The requisites of a good crosshead guide are:

1. That it shall present sufficient wearing surface to meet the pressure produced by the inclination of the connecting rod, and enough surface to meet side pressure.
2. That it shall be strong and so stiff that it cannot spring and cause the ends of the crosshead to press hard upon it, even when the steam is admitted to the cylinder to the latest point of cut off.
3. That it shall not expose the wearing surfaces to dust and cinders.
4. That it can be cheaply made and easily fitted up.
5. That it can be easily trued up after service.
6. That it shall permit its crosshead to be of a strong, light and cheap form.
7. That it, or its crosshead, can have compensation for wear.
8. That all parts shall be easily accessible.

The order of the examination of the guides and crossheads will be as follows:

A. The modern, four-bar guide, with upper bars wider than the lower, the latter being of angle form.

B. The Laird guide and cross-head, as made by the Rhode Island Locomotive Works.

C. The single bar guide, as made by the Mason Machine Works.

D. The two-bar guide, as designed and used by the Pennsylvania Railroad.

E. The Dean patent guide.

The Four Bar Guide.—In considering this familiar form, it is obvious that there is no limit to the amount of surface which can be given to the crosshead to meet pressure and wear in any direction. If the locomotive moves forward, the effect of the inclination of the connecting rod is to cause the crosshead to press upward when propelled by steam, when making either the forward or backward stroke. When the locomotive is running backward with steam on, or in either direction with steam off, the crosshead presses downward. The crosshead and guide should be designed to be most efficient for the engine when running forward, for all classes of engines except switching engines.

This peculiarity of pressure has been kept in view in designing the modern four-bar guide, and the upper bars are made wide, the upturned longitudinal rib of the crosshead being omitted in order to prevent the over-all width of the guides from being excessive. The omission of this rib takes away from the surface which receives side pressure caused by "slap" and twisting the engine. This is made up by making the lower bar narrow and with a downward projecting rib, against which the crosshead can press. Thus the first condition can be, and is, generally perfectly fulfilled.

The second condition cannot be so well met, as the bars must be very heavy in order to be strong and stiff. The

TABULATED RESULTS OF EXPERIMENTS IN CONTINUOUS HEATING, FROM REPOR

QUESTIONS ANI

QUESTION No. 1.—NAME OF SYSTEM IN USE OR ON TRIAL.	NAME OF RAILROAD REPORTING.	No. II.—What is heating medium?	No. III.—Is car heated by direct or indirect radiation?	No. IV.—From what source is heat taken.	No. V.—Are main pipes inside or entirely under floor of car?	No. VI.—What pressure carried in main pipes?	No. VII.—What pressure carri'd in heating pipes.	No. VIII.—Is any special provision made for ventilation of car	No. IX.—If ventilation provided for, is air taken in at top of car or from below the floor?	No. X.—How is temperature regulated, and does it require constant attention?	No. XI.—Time required to raise temperature of car to 70° when outside temperature is 20° by same scale?	No
1. Automatic Car-coupler Heating Co	Detroit, Lansing & Northern Railroad	Water	Direct	Locomotive	Under floor.	5 to 20 lbs.	5 to 20 lbs	.....	Answered by No. 3.	Regulating valve; requires more or less attention	Temperature of car raised to 66° in 15 minutes, with outside temperature 5°.	Ca
2. Baker Heater Steam-heating Co	Pullman Palace Car Company, over Pennsylvania lines, Mar. 3, '88	Brine water circulation.	Indirect (?)	Locomotive	Under floor.	3 to 5 lbs.	3 to 5 lbs.	Deck sash opened alternately on each side	Not in use.	By valve attached to circulating pipe.	About 1 hour	Ba
	Pennsylvania Company, Pullman cars over their lines, Mar. 3, '88	Water, Baker heating pipes.	Direct	Locomotive	Under floor.	40 to 50 lbs	40 lbs. water and 25 lbs. steam.	Under trial		By valves in steam pipes; yes	About 3 hours	No
3. Boston & Providence	Boston & Providence	Steam	Direct	Locom'tive	All possible inside of car.	0 to 40 lbs.	0 to 40 lbs.	No		Valves; do not require constant attention	No reliable data	
4. Burlington, Cedar Rapids & Northern	Burlington, Cedar Rapids & Northern, Feb. 25, '88	Steam	Direct	Locomotive	Inside of car.	5 to 15 lbs	About 5 to 15 lbs.	No.		Regulating drip and steam valves, more or less attention	1 hour and 45 minutes, with outside temperature 6° below zero	St
5. Chicago, Milwaukee & St. Paul (Gibbs' system)	Chicago, Milwaukee & St. Paul, Feb. 24, '88	Steam	Direct and indirect	Locom'tive	Above floor inside or out, preferred	Never more than 30 lbs.	Varies with position of car.	Yes	Top of car through air induction pipes of spear heater	Automatic temperature regulator; no attention in 3 months	About 45 min	No
6. Erie Car-heating Co	Lake Shore & Michigan Southern, April 24, '88	Steam	Direct	Locomotive	Under floor.	5 to 10 lbs.	5 to 10 lbs.	No		Valves; very little attention	20 to 30 minutes.	No
7. Gold Car Heating Co	Boston & Providence	Steam	Direct	Locom'tive	All possible inside of car	0 to 40 lbs.	0 to 40 lbs.	No		Valves; do not require constant attention	No reliable data.	Dr
	Penn. R. R. Co., Pullman cars over their lines, Mar. 3, '88	Water, Baker heater pipes.	Direct	Locomotive	Under floor.	20 to 40 lbs	40 lbs. water; about 25 lbs. steam.	No		By valves on steam pipes; no	About 1 hour and 30 min	No
	Pullman Palace Car Co., over P. R. R. Co. lines, Mar. 3, '88	Water, Baker heater pipes.	Indirect (?)	Locomotive.	Under floor.	7 to 40 lbs.	5 to 80 lbs.	Deck sash	Not in use.	Valve on circulating pipe; one adjustment per trip	About 1 hour or more	No
8. Graydon Safety Car Heating Co	Terre Haute & Indianapolis Rail road, Feb. 28, '88	Steam.	Direct.	Locomotive.	Inside of car.	5 to 10 lbs.	5 to 10 lbs.	No		Adding or reducing heating surface; considerable at ention	2 hours	31
9. McElroy Car Heating Co	Delaware & Hudson Canal Co., Feb. 22, '88	Steam; (water in car).	Direct.	Locomotive.	Under floor.	15 to 40 lbs	Not to exceed (6) lbs.	No.		Valves; requires but little attention	1 hour	No
	Boston & Albany	Steam.	Direct.	Locomotive.	Under floor.	2 to 20 lbs.	2 to 20 lbs.	No		By admitting or reducing steam	20 to 30 min.	No
	Grand Rapids & Indiana, May 7, '88	Steam	Direct.	Locomotive.	Under floor.	About 5 lbs	About 5 lbs.	No		Usual method; no more attention than Baker heater	About 40 min.	St
10. Martin Anti-Fire Car Heater	Grand Trunk	Steam	Direct.	Locomotive.								
	Lake Shore & Michigan Southern, April 23, '88	Steam.	Direct.	Locomotive.	Under floor.	5 to 10 lbs.	5 to 10 lbs.	No		Valves; very little attention	From 20 to 30 minutes	No
	New York, Lake Erie & Western, April 30, '88	Steam.	Direct.	Locomotive.	Under floor.	10 to 30 lbs	0 to 25 lbs.	No	Upper deck and door sash	Valve; requires but little attention	About ½ hour.	St
	Richmond & Danville, May 28, '88	Steam.	Direct.	Locomotive.	Under floor.	About 5 lbs.		No	Top of car	Valves; require occasional attention.	About 30 min.	St
11. Northwestern Car Heating & Lighting Co	Northern Pacific, April 30, '88.	Steam.	Direct.	Locomotive.	All inside car	4 to 10 lbs.	4 to 10 lbs.	No		Regulating valve; no	20 to 30 minutes	H
12. New York Lake Erie & Western.	New York, Lake Erie & Western, Feb. 23, '88	Steam.	Direct.	Locomotive.	Under floor.	10 to 30 lbs	0 to 25 lbs.	No	Upper deck ventilation only	Valve; requires but little attention	About 30 min.	C
	Chicago & Grand Trunk, April 6, '88.	Steam and water circulation	In connection with Baker heater.	Locomotive.	Under floor	About 10 lbs.	No pressure to speak of.			Valve	About 30 min.	H
	Lake Shore & Michigan Southern, Mar. 23, '88	Steam and water circulation	In connection with Baker heater.	Locomotive.	Under floor	50 lbs at times	Answered in No. 6	None		Valves; very little attention	At least 2 hours	H
13. New York Safety Car Heating & Lighting Co	Michigan Central, May 9, '88	Steam and water circulation	In connection with Baker heater.	Locomotive.	Under floor.	5 to 20 lbs.	2 to 10 lbs.	No		Valve; no special attention.	About 2 hours	N
	Penn. Railroad Co., Pullman cars over their lines, Mar. 3, '88	Steam and water circulation	In connection with Baker heater.	Locomotive.	Under floor.	30 to 50 lbs	40 water, 25 steam	No		Valves on steam pipes; yes	About 2 hours	N
	Pullman Palace Car Co., over P. R. R. Co., lines, Mar. 3, '88	Steam and water circulation	Indirect (?)	Locomotive.	Under floor.	7 to 40 lbs.	5 to 80 lbs.	Deck sash		Valves; constant attention	About 2 hours	H
14. New York Safety Car Heating & Lighting Co., combined with Williames' system of railroad car heating	New York, Lake Erie & Western, Feb. 23, '88	Exhaust and live steam and water circulation	In connection with Baker heater.	Locom'tive	Under floor	0 pressure required by weather.	0 to Baker Heater pressures	No	Upper deck ventilation alone	Valve; does not require much attention	No data	
15. Pennsylvania	Pennsylvania Company, Altoona, Pa., Mar., '88	Steam.	Direct and indirect.	Locomotive.	Under floor.	7 to 10 lbs.	About 5 lbs.		From below floor	Valve; more or less attention	40 minutes	N
16. Pennsylvania (Williames' principle)		Steam.	Direct and indirect.	Locomotive	Under floor.				From below floor	Valve; more or less attention	40 minutes.	N
	Boston & Providence	Steam.	Direct.	Locomotive.	Under floor	0 to 40 lbs.	0 to 40 lbs.	No		Valves; do not require constant attention	No data.	
	Grand Rapids & Indiana, May 7, '88.	Steam.	Direct.	Locomotive.	Under floor	About 5 lbs.	About 5 lbs	No		Usual method; no more attention than Baker heater	About 40 min	S
17. Sewall Safety Car Heating Co	Grand Trunk, Feb. 13, '88	Steam	Direct.	Locomotive.								
	Lehigh Valley, Feb. 21, '88	Steam.	Direct.	Locomotive.	Under floor.	0 to 100 lbs.	0 to 100 lbs.	No		Valves; require constant attention.	About 45 min.	B
	Michigan Central, May 3, '88	Steam.	Direct.	Locomotive.	Under floor.	5 to 20 lbs.	2 to 10 lbs.	No		Valve; does not require special attention	1 hour and 5 min.	A
18. Wisconsin Central	Wisconsin Central	Steam.	Direct and indirect.	Locomotive.	Inside of car.	10 lbs.	5 to 10 lbs.	Yes	From below floors	By engineer; no	12 to 15 min.	N

REPORTS COLLECTED BY THE COMMITTEE OF THE MASTER CAR-B

ONS AND ANSWERS.

ime re- raise ure of ° when tem- is 20° cale?	No. XII.—What provision is made for retaining a comfortable temperature after heat supply from main source is cut off?	No. XIII.—For what length of time can this temperature be maintained, outside temperature 20° above zero?	No. XIV.—How is water of condensation in main steam pipes as well as in heating pipes disposed of?	No. XV.—If traps are used, what kind of instrument has been found most reliable?	No. XVI—Is it necessary to permit steam to waste through rear coupl'g	No. XVII.—it neces-a to keep sy tem charg with stea or wate heated, prevent freezing?
e of 60° utes, ide e 5°.	Cars equipped with Smith & Owen heating system, which piping was used for continuous heating..	Longer than when steam was used for the heating medium.....	Returned to locomotive through a return pipe..	No necessity for traps	Not necess'y	Circulation sufficient to keep cars warm all that was necessary..
r....	Baker heater and accompaniments as an auxiliary.....	As long as Baker heater kept with fire.....	Traps..... ..	No trap found reliable, expansion rod trap found most desirable. .	Yes, at all times.	Not necessary... ....
rs ..	None except Baker heater and its accompaniments....	About 1 hour....	Traps and drip cocks.	Not satisfactory....	Yes.. .	Not necessary.....
lata .	.....	No data.....	By traps and valves.....	Not yet found a reliable trap.....	Yes....	Advisable in extreme weather, but not necessary... ..
45 with tem- 6°)....	Stoves retained..	2½ hours, falling from 82° to 68°, while outside temperature fell from 20° to 4° above.. .. .	By drip valves with small opening in them.....	None used.	No.....	Cars kept constantly charged....
n	None within car....	At 20° above, about 1 hour..	Trap.....	Ordinary form of differential expansion trap...	No.... ..	No . .. .
tes.	No provision yet; think one stove should be retained..... ..	No information...	Trap	Expansion of brass rod	No.....	No .....
data.	Drum filled with brine inside each heater..	No data.....	By traps and valves	Not yet found a reliable trap.	Yes....	Advisable in extreme weather, but not necessary....
hour	None except Baker heater and accompaniments.....	About 1 hour.....	Traps.....	Traps not found reliable	Yes....	Has been done, but not considered necessary... ..
hour . . .	None except Baker heater and its accompaniments..... ...	About 2 hours.....	Traps..... ..	No trap tried found reliable	Yes....	Yes..... ..
.....	Stoves retained..... ...	About 1 hour....	Reservoirs under cars; some water forced back to tank.....	Return made to tank.	.....	Necessary to keep pipes heated or entirely drained
....	None except Baker heater and its accompaniments.....	For 4 hours without fire in stoves.....	Trapped off through overflow...	Mc Elroy automatic trap.....	Yes....	Yes, if car in use; no, if not in use and pipes are drained
.....	None except closing the car..... ...	Perhaps from ¾ to 1 hour ..	Trap.....	Have not yet decided	No.....	Yes..... . ..
. .	Stoves retained	About 2 hours without using stoves	Trap.....	Martin Car Heater Co. trap	No.	No.....
.... .	.....	... .	.....	.....	....	. .....
30 ...	No provision yet, but think one stove should be retained.....	No information....	Trap	Expansion of brass rod	No.....	No... .. ..
r....	Stoves retained.....	....	Trap	Open frame expansion.....	No.....	No.....
. ....	Stoves retained.....	. .. .	Trap....	Elliptic	No.	No.....
ites...	Hot air drums.....	2½ to 3 hours.....	Trap	Automatic float trap....	No.....	No.. .....
n.. ..	One stove retained.....	.....	Trap	Simple brass and iron tube.....	No.....	No.....
)....	Required to light Baker heater.....	About 1 hour.....	Trap.....	....	No.....	Yes.... ....
urs...	Baker heater and accompaniments...	No information ..	Trap	....	.....	. . ..
rs..	None except Baker heater and accompaniments	About 1 hour.....	Trap	Metal expansion trap	More or less so	Yes.....
rs..	None except Baker heater and accompaniments	About 1 hour.....	Trap	Not reliable.....	Yes ...	Has been done, no necessary.
rs..	Baker heater and accompaniments as an auxiliary	Indefinitely by Baker heater..	Trap.....	Unsatisfactory.....	Yes.... .	Yes.....
. . .	Baker heater and its accompaniments	.....	Returned to locomotive	None used.....	No... ...	No trial mad
....	None excepting metal of pipe; one stove retained.....	Average fall, 15° Fahr. per hour	Trap	Curtis' frost proof has given good service.....	Yes.....	No..... ...
...	None, excepting metal of pipe; one stove retained.....	Average fall, 15° Fahr. per hour	Return water of condensation to engine tank.....	....	Yes.....	No.....
.....	....	No data.....	Traps and valves. ...	Not yet found a reliable one..	Yes ...	Advisable in extreme weather, but not necessary ....
' ...	Stoves retained..... ...	About 2 hours without using stoves	Trap	Martin Car Heater Co. trap	No.....	No..... ..
.....	....	....	... .	....	.....	. .....
n....	By closing the opening between main and heating pipes.....	....	Trap	Unable to answer yet	No....	Either constantly charged or emptied.
min...	Auxiliary heaters or stoves.....	About 1 hour.....	Trap	Metal expansion trap	No.... ..	No... ....
.....	None.....	.....	Condenser under car..	....	Yes, on suburban trains.	No.....

XVI	No. XVII.—Is it necessary to keep system charged with steam, or water heated, to prevent freezing?	No. XVIII.—What kind of flexible connection has been used between cars?	No. XIX.—What kind of packing joints for keeping couplings tight have given most satisfactory results?	No. XX.—To what number of cars can the heat be transmitted or has been transmitted?	No. XXI.—What has been the general results of the working of the system tried or in service?
s it ces- y to mit eam vaste ough ear apl'g	Circulation sufficient to keep cars warm all that was necessary.	Metallic, with telescopic ball and socket joint	Hydraulic packing made of cotton, kept tight by the pressure		Was a success and gave good satisfaction.
ne- s'y at ll es.	Not necessary	Sewall coupler with rubber hose	Vulcabeston	6 or 7	Very satisfactory, requiring very little attention.
	Not necessary	Sewall coupler with rubber hose	Rubber	6	Unsatisfactory; when temperature is 20° above zero it has been found necessary to have fires in stoves.
	Advisable in extreme weather, but not necessary	Rubber hose	Rubber	Unknown	Not entirely satisfactory; many changes yet to be made.
	Cars kept constantly charged	Flexible hose with ball and socket joint	Ground joint	4	General results very favorable; will apply steam pipes to all of our passenger equipment as fast as we can get them through the shop.
	No	Rubber hose	Hardest grade of vulcabeston on metallic diaphragm		As far as heating goes, a perfect success; for comfort and healthfulness, the combination of indirect radiation and ventilation has been a great addition.
	No	Coil pipe, with telescopic sleeve	Plumbago and hemp		Think the pipe coil is better than a ball and socket joint.
	Advisable in extreme weather, but not necessary	Rubber hose	Rubber	Unknown	Not entirely satisfactory. Many changes yet to be made.
	Has been done, but not considered necessary	Rubber hose (Sewall coupler)	Rubber	6	Very good and satisfactory.
	Yes	Rubber hose (Sewall coupler)	Vulcanized rubber	7 cars each 80 ft. long	Unsatisfactory on account of requiring educated mechanical help.
	Necessary to keep pipes heated or entirely drained	Metal coupler	Rubber joints	See No. XXI	Does very well for not more than five cars, but as many important laws in relation to steam heating are ignored the results are not satisfactory.
	Yes, if car in use; no, if not in use and pipes are drained	Flexible hose with metallic coupler	Canvas with small amount of rubber	When circulation established, all the cars an engine can haul	Satisfactory.
	Yes	Used metallic, but think will come to flexible hose	Not yet decided	About 12	Generally good, but not yet satisfactory.
	No	Ball and socket with telescopic sleeve	Rubber		Satisfactory.
					Reasonable satisfaction, but it is thought the pressure of steam in the radiating pipes, which appears necessary, is too high in case of accident.
	No	Ball and socket with telescopic sleeve	Plumbago and hemp		Ball and socket joint not as good as pipe coil.
	No	Metallic coupler		No data	Everything satisfactory except couplings, which cause trouble from leakage and need frequent repairs and renewals.
	No	Metallic, ball, socket and telescopic joint	Lead	10	Very satisfactory.
	No	Metallic universal joints	Jenkins' packing		Think system fully equal to and as nearly perfect as any in use on any of the roads in the northwestern country.
	No	Rubber hose	Vulcabeston gasket at coupling	No data	Results satisfactory as far as tried.
	Yes	Rubber hose	Rubber		Good in moderate weather, but trouble about freezing in pockets of globe valves in severe weather. Not under trial sufficiently long to judge of its merits thoroughly.
			Plumbago and hemp		Failure.
re or ss so	Yes	Rubber hose	Vulcabeston		Failure.
s	Has been done, not necessary	Rubber hose (Sewall coupler)	Rubber	6	Fair and very good.
s	Yes	Rubber hose (Sewall coupler)	Vulcanized rubber	7 cars, each 80 ft. long	Unsatisfactory on account of requiring educated mechanical assistance.
	No trial made	Rubber hose	Rubber	No data	Trial not advanced enough to furnish conclusions.
s	No	Corrugated rubber hose	Rub'r gasket as the best that could be found	Thought 10 without difficulty	More or less objectionable from escape of steam at traps and products of condensation dropping at stations, etc.
es	No	Corrugated rubber hose	Rubber gasket as the best that could be found.		Comparatively satisfactory.
es	Advisable in extreme weather, but not necessary	Rubber hose	Rubber	Unknown	Not entirely satisfactory; many changes yet to be made.
o	No	Rubber hose	Rubber		Satisfactory.
					Reasonable satisfaction, but it is thought the pressure of steam in the radiating pipes, which appears necessary, is too high in case of accident.
o	Either constantly charged or emptied	Rubber hose	Unable to answer yet	9 cars	Still in the experimental stage with it.
o	No	Rubber hose	Vulcabeston		Good.
es, on suburban trains.	No	Rubber hose	Brass connection with rubber gasket.		In constant service for one month with very satisfactory results.

lower bar does not in any way assist the upper except when they are tied together by a bolt passing through side lugs on both—a feature adopted by the Manchester Locomotive Works.

The third condition is very imperfectly fulfilled, the upper bars only protecting the wearing surfaces to some extent. Dust and cinders can find lodging places on the lower bars, and can be ground in between the surfaces which take side wear. The rear engine of two coupled ones will generally receive a shower of cinders upon its guides, and in some parts of the West sand is blown on the guides, cutting the lower bars. This can be to some extent prevented by shielding the guides, and in some instances the upper bars have been changed to one broad one.

The fourth condition is not fulfilled as well as desirable. There are four bars, four blocks and four bolts, and each bar is of the nature of a bolt. Considerable skill is necessary in properly fitting those parts so that each wing of the cross-head shall always properly bear upon the bars.

The bars and crosshead can easily be trued after being worn. The crosshead can be strong, light and cheap, and compensation for wear can be made either by adjusting the bars upon the blocks, or by adjusting gibs upon the cross-head or both.

The Laird Guide.—This is a two-bar guide, with both bars above the piston rod, one bar being wider than and immediately above the other. The bars can be of any width, and the upper bar can be, and generally is, made wider than the lower, thus giving the needed extra surface for upward pressure. The upper bar usually takes all of the upward pressure, but the Mason Machine Works have made Laird guides with the crosshead pressing upward upon both bars; but probably the nice fitting needed to make both wearing surfaces effective would prevent most builders from following this practice. The lower bar passes through the upper part of the crosshead and takes all of the downward and the side pressures.

There is no limit to the width of this guide for an American or ten-wheel locomotive, and for a mogul or consolidation engine the available width of space is fully utilized to secure a wide upper bar.

By employing sufficient material, the bars can be made as stiff as desirable, but no assistance of one bar can be secured from the other, and in this respect the design is unscientific and wasteful of material.

The wearing surfaces are nearly as badly exposed to cinders and dust as those of the four-bar form.

In cheapness the guide is preferable to the four-bar form, as there are half as many bars and half as many blocks, and the labor of fitting is considerably less.

It can be easily trued up after being worn.

The crosshead can be strong, light and durable, but it is rather expensive, as it consists of two pieces and five ream bolts, all of which require considerable fitting to make a good job.

There is no difficulty in providing compensation for wear, either on the bars or crosshead.

The Single Bar Guide.—The bar is above the piston rod.

This form of guide can be of any width where there is unlimited space, but as the crosshead surrounds the bar, the available space on a mogul or consolidation engine cannot be used advantageously. The surfaces for downward and upward pressure are equal, and there is ample surface to meet side pressure.

By employing sufficient material, the guide can be made stiff.

All of the surfaces are exposed to dust and cinders.

This is the cheapest guide of all forms, but it can compensate for wear in only one direction, that in the other being taken up by a gib in the crosshead.

The crosshead is almost identical with the Laird crosshead, and calls for the same remarks.

The Two Bar Guide.—One bar is above the piston rod, and the other below.

This is a kind of guide which is used extensively in England and on the continent of Europe, is adopted by the Pennsylvania, by the N. Y., L. E. & W., and is being tried on the N. Y. & N. E. It is simple and accessible.

In regard to the first requisite, it can be of any width, and the upper bar can be made wider than the lower. The side pressure is taken by both bars.

By using sufficient material the guide can be stiff, but the Committee knows of no case where the bars are connected together, so that one bar assists the other, except on locomotive No. 383 of the Lehigh Valley.

The wearing surfaces are entirely exposed to dust and cinders, and it may be worse in this respect than any other form, because the lower bar is so low that it may receive an extra quantity of dust set moving by the truck wheels, or by a leading locomotive. We should look for cutting of the lower bar and the edges of both bars.

On a mogul or consolidation locomotive this form does not use the available space to so good advantage as the Laird guide, because the cross-head must be wider than the upper bar.

The guide can be cheaply made and fitted up more easily than the four-bar form, and about as easily as the Laird guide.

It can be easily trued after service, and wear can be easily taken up.

The crosshead is light, strong and elegant in form, but is expensive, inasmuch as, not counting gibs, which may or may not be used, it consists of three pieces; viz.: a wrought iron or cast steel centre, and two cast iron shoes. These parts require considerable machining and fitting.

The Dean Patent Guide.—The guide is above the piston rod. This form of guide, being new, will be minutely described. It fulfills the first requisite by presenting an extra wide surface for taking up the pressure of the crosshead, as much as is required for taking the downward pressure, and more than usual for taking the side pressure.

The downward pressure is taken by angle pieces which are rigidly connected their full length to the upper, or main bar. The guide thus resembles a box girder with upper and lower flanges and webs connecting them. It is thus the most scientific in the use of material of all of the guides. The angle pieces are let into the upper bar and secured to it by four free bolts, end motion of the angle pieces being prevented by the cylinder head at one end and the yoke at the other, against which they abut.

The depth of the guide, together with its girder form, cause it to fill the condition of stiffness more perfectly than any other form.

The third condition is also more perfectly fulfilled than by any other, because the wearing surfaces are wholly within the girder or guide, and entirely out of the path of the particles of dust and cinders. All surfaces for upward, downward and side wear are consequently fully lubricated by clean oil, and cutting can never occur as long as oil is applied. In cost it is considered to be cheaper than the four-bar form, as it consists of three pieces against eight in the four-bar form. These three pieces can be fitted together and then all three squared off in a lathe or planer, and put in position as one piece.

Its width over all is about equal to that of the four-bar form, and for that reason it is not likely to be used on any locomotive which has a driving wheel between the guide and the frame.

In comparison with the Laird guide, it is probably more expensive in machine work but less so in fitting.

It can easily be trued up after being worn.

The crosshead is of a simple, light, durable form. It consists of one piece without the gib.

As thus far designed, there is no way to compensate for wear by adjusting the guide, and the gib is therefore used for that purpose.

Your Committee is unable to see that it is material whether compensation for wear is made by adjusting the guides or the gibs. If the guides are adjustable, they must rest on blocks, which are bolted to the cylinder head and yoke. In this case the gibs can be omitted. The cost of the blocks will about equal the cost of the gibs. Gibs, of course, are always useful in preventing wear of the crosshead body.

Your Committee, in summing up the advantages of the different forms of guide and cross-head, and recommending them for adoption, is of the opinion that for the eight-wheel American type, and the ten-wheel locomotive, the Dean guide and cross-head fulfill the conditions and perform the functions of perfect devices to a greater degree than any other form. On locomotives, such as moguls, consolidation and decapods, where the width of the Dean guide renders it difficult to secure clearance for the forward crank-pin, the Laird guide is recommended. It is so constructed as to use all of the available space for width of the upper bar; is more nearly dust and cinder proof than any of the open forms; is fully as cheap as any form, and in common with the Dean is above the piston rod, and leaves the stuffing box accessible.

For switching engines, which run as much in one direction as the other, from a theoretical standpoint the single bar or two bar form would be best adapted, but for the sake of having the smallest variety of patterns in service, and having the parts as free from dust and cinders as possible, the Laird is recommended for this class of engines.

There are a variety of ways by means of which the cross-head box of the connecting rod can be efficiently adjusted, but with the crosshead for the two-bar guide, the small space about the end of the connecting rod has generally forced the adoption of a transverse key, of necessarily limited range of adjustment. To overcome this objection, Mr. J. B. Henney, of the N. Y. & N. E., has used an "expansible cross-head pin," which consists of a central tapered pin, which is surrounded by hollow pin, split lengthwise on one side. The taper of the central pin and of the inside of the hollow pin is very slight. Both pins pass entirely through the crosshead, and each has nuts on one end for securing it. The outside of the hollow pin is steeply tapered, and fits the tapered inside of a sleeve which surrounds it. This sleeve is divided into halves vertically, in order to allow them to separate horizontally. These halves fit the connecting rod-box, and are square on both ends. The square parts fit into grooves on the crosshead, which prevent them from turning. When it is desired to take up lost motion, the central pin is slackened up and driven slightly back, after which the hollow pin is drawn forward by means of the nuts on its end. This expands the outside sleeve, and thus takes up the lost motion. After this the nuts are all set up and the whole system becomes solid. Mr. Henney's claims are as follows:

1. A good working crosshead complete with pin.
2. Less and longer wear of brasses.
3. Solid end main rod of simple construction.
4. Length of main rod more nearly preserved.
5. Less labor in lining and closing brasses.

The pin had been in service 18 months up to Oct. 1, 1887. About $\frac{1}{4}$ of a turn per month is given to the nuts on the hollow bolt or sleeve, which expands to the bushings $\frac{1}{100}$ of an inch. As there is a possible expansion of $\frac{31}{100}$ of an inch, the engine should run 31 months before it will be necessary to take down the rod for shimming the brasses.

The tapered hollow pin can fit the expansible sleeve but once, either at the beginning or end of its path. The drawing indicated that there is no attempt at making it fit at any time, the only requisite being that there shall be one line of contact between the hollow pin and each half of the expansible sleeve, both lines of contact lying in a horizontal plane passing through the axis of the pin. This would permit the sleeve to roll on the hollow pin, if it were not prevented by the square ends.

It will be seen that the action of this means of adjustment is to cause boxes, which wear out of the circular form, to work against a pin, which is thrown out of the circular form, and the more the adjustment is made, the greater the deviation is from the circular to the oblong form. It is evident that the box must wear much faster than the pin, and if the pin is solid it will be practically round for many years, and the beauty of moving the boxes is that when they are adjusted they are brought up to a circular pin, against which they can turn without difficulty, even if they are not themselves truly circular.

This system of pins and bushings must be very expensive, but if the end justifies the means, there is no need of complaint.

In regard to the material for crossheads and guides, your Committee recommends cast iron for guides and steel castings for the crossheads. If, however, a true open hearth steel casting is used, it must be protected by gibs. Eureka steel castings will run without gibs, and so, probably, will any other decarbonized cast iron. For gibs your Committee recommends cast iron.

There can be nothing better for rubbing surfaces than cast-iron, if well lubricated. If it is exposed to dust and cinders, it would be well to use strips of Babbitt metal, but with the Dean crosshead, which always runs in clean oil, this is unnecessary. Phosphor-bronze gives admirable results for crosshead gibs. Whatever form or material is used for cross-heads and gibs, the rubbing parts should always be well scored with grooves for retaining oil to supply to the moving parts, as they journey back and forth

J. N. LAUDER,
W. J. ROBERTSON,
H. S. KOLSETH,
Committee.

Mr. LAUDER said the Dean crosshead had been in continuous service for five years and expected it to run for five years more, and had consequently adopted it on all engines.

Mr. HICKEY (Milwaukee, Lake Shore & Western) used 16 in. crosshead, 4 in. wide for 18 in. cylinder engines. Cast-iron bars gave 10,000 miles per $\frac{1}{64}$ in. wear, while case hardened iron gave 70,000 to 75,000 miles for same wear. The cast-iron guides cost $25, the case hardened $105, and the latter are much the most satisfactory.

Mr. BOON used Laird guide for freight engines and Pennsylvania crosshead for passenger service, as it allowed for larger truck wheels, which were very necessary. It also gave ample bearing surface and plenty of room on a curve. They can be carried in store ready fitted. He lined guides for taking up wear. Shoes would break if play exceeded $\frac{1}{4}$ in. Considered this form of guide best for fast passenger service.

Wheel Centres.—Some discussion then took place on the question of standard diameters of wheel centres. It was pointed out that it was a question of economy, and that the adherence to standard tires and wheel centres would enable tires, etc., to be more cheaply and readily procured.

The President stated the standard was very generally adopted, though some were unwilling to make change.

Mr. W. E. Lockwood and Mr. O. E. Stewart rose and made some remarks, but the President ruled them out of order.

The following is a somewhat condensed Report of the Committee on Springs and Equalizers, which was then read:

We have received answers from but 12 roads, the substance of which is as follows:

1. What size of steel do you consider gives the best results in locomotive driver and engine truck springs? It is assumed that crucible cast steel is used, but if not, please state what kind of steel you recommend? One spring maker, and one railroad prefer $3\frac{1}{2} \times \frac{5}{8}$ in.; ten prefer $3\frac{1}{2} \times \frac{5}{8}$ in., and one road uses $3\frac{1}{2} \times \frac{1}{2}$ for driving, and $4 \times \frac{1}{2}$ in. for engine truck.

2. What length of spring, from centre to centre of hangers, gives the best results for both driving and engine truck springs? Two roads report 32 in.; one, $33\frac{1}{2}$ in.; one, 35 in.; one, 35 to 36 in.; three, 36 in.; one, $36\frac{1}{2}$ in.; one, 38 in.; one, 41 in., and one, 39 to 48 in.

3. How many plates should be in each driving spring to carry an eight-wheel passenger engine with about 56,000 lbs. on the driving wheels or about 14,000 lbs. on each driver? One answers 9 plates; three, 10 plates; one, 11 plates; three, 12 plates; one 14 to 15 plates, and one, 15 plates.

4. How many plates for engine truck springs, with about 34,000 lbs. on truck wheels? One uses 12 plates; one, 10 plates $11 \times \frac{3}{4}$ in.; two, 13 plates; two, 14 plates; two, 15 plates. One spring maker 15 plates $4 \times \frac{5}{8}$ in and 16 plates $3\frac{1}{2} \times \frac{3}{4}$ in.; two roads, 16 plates, and one, 16 to 18 plates.

5. How much camber, or set, should such driving and truck springs have when free? How much when loaded with the above weights? One road answers $\frac{3}{4}$ to 1 in. for driving loaded and 1 to $1\frac{1}{4}$ in. for truck loaded. One spring maker and three roads use 2 in. for driving and truck springs loaded; C., St. L. & P. R. R., $2\frac{1}{4}$ in. for driving and 2 in. for truck loaded; M., L. S. & W. Ry., $2\frac{1}{4}$ in. for driving and truck loaded; S. F. & W. Ry., $2\frac{3}{4}$ in. for driving and truck loaded; C. V. R. R. 4 in. for driving and truck loaded, and C., N. O. & T. P. Ry. $7\frac{1}{2}$ in. over all for driving and $6\frac{3}{4}$ in. over all for truck loaded.

6. Do you recommend the same size of steel, and distance between hangers, for all classes of engines and regulate the capacity by the number of plates, or do you have different sizes of steel to change the capacity? If the latter, please state the advantage of the plan. One spring maker and all the railroads mentioned above recommend the same size of steel, and distance between hangers, for all classes of engines and regulate the capacity by the number of plates.

7. Please state your preference for the attachment of the spring hanger—slot or stirrup—and give your reasons for the preference. One spring maker recommends slot and stirrup. One road prefers the slot, because the width is generally too limited to permit a stirrup without cutting away the sides of the spring, and their method of slotting has never caused any serious trouble. One prefers the slot; handier to connect and cheaper to make; looks better and lasts just as long; use the stirrup on truck springs. Another considers slot cheaper and permits of better adjustment, easier taken care of and more convenient to replace in case of breakage. Another finds slot easier made; keeps clear of the fire-box, thereby saving wear to the latter and itself. One road prefers the slot for driving springs and the stirrup for truck springs. One road prefers the slot; the bearing is much more uniform and less liable to fracture the plate, it also lessens rigidity and aids elasticity. Two roads prefer the slot in both driving and truck springs, it gives more room and does not crowd the fire-box; is cheaper and more easily adjusted and more accessible in case of breakage.

8. What is your method of applying bands? What size of iron do you use, and is there any advantage in making the bands wider at the bottom than at the top? Two roads answer that the bands are placed on hot and upset with sledge and flatter, bands are made by hand $3\frac{1}{2} \times \frac{1}{2}$ in. for engine truck springs. One road says that with bands wider at bottom than at top much of the flexibility of the lower leaves is lost. One road uses $4 \times \frac{3}{4}$ in. iron for bands. Another claims the best results have been obtained from bands $4 \times \frac{1}{2}$ on sides and top and 1 in. thick on bottom a slight advantage being gained by making bands wider at the bottom than at top, the tendency to tilt or turn to or from the fire-box is lessened by the broad bottom, while the elasticity of the spring is not reduced if the band is properly proportioned, but does not consider the advantage gained sufficient to cover the additional expense of making bands. One road makes and prefers bands for driving springs $3\frac{1}{2} \times \frac{1}{2}$ in. on top and sides and $\frac{3}{4}$ in. thick on bottom, and for truck $4 \times \frac{1}{2}$ in. on sides and bottom and $\frac{3}{4}$ in. thick on top. In this case the truck springs are reversed from the driving springs. Another uses $2\frac{1}{2} \times \frac{5}{8}$ in. iron, and there is no advantage in having bands wider at top or bottom, as it would hinder the natural movement of the spring plates.

One makes spring bands on forward truck springs $3\frac{3}{4}$ in. on bottom and 2 in. on top by $\frac{3}{4}$ in. thick, and spring bands on driver $3\frac{1}{2}$ in. on bottom and 2 in. on top by $\frac{5}{8}$ in thick. These dimensions give good results.

9. Have you had any experience in the use of bandless springs? One road answers yes, but not satisfactory. Another has used bandless springs, but not long enough to decide on their merits.

10. What is your practice in regard to equalizers for driving springs? Do you recommend a solid bar or one slotted for a post? Please send sketch or blue print showing equalizers and attachment both in the centre and to springs. One uses solid bar with slotted ends to receive hangers. The centre has a bearing on a steel pin $1\frac{1}{2}$ in. diam., the whole contained within a clasp which is bolted to the main frame. All the other roads report using equalizers slotted for a post upon which it bears by means of a steel key through the post, the bearing surface on equalizers being faced with steel. Another has several engines with frame slotted to allow the post to pass through, and prefers this practice as less liable to give trouble from breakage of bolts. The post is slotted for a steel gib, and steel dies are fitted on the top of the equalizers for the gib to work on.

11. What is your practice in regard to engine truck equalizer? Please send sketch or blue print of equalizer and attachment to truck box and spring. All the replying roads say their engine truck equalizers are composed of two parts from $\frac{1}{2}$ to $\frac{5}{8}$ in. thick by 4 to $4\frac{1}{2}$ in. wide, and connected as shown in cuts.

12. Please send sketch or blue print of what you would recommend as the best form of equalizer and attachment for a mogul or two wheel truck. The only print received is shown herewith.

The Committee make the following recommendations:

1. $3\frac{1}{2} \times \frac{5}{8}$ in. crucible cast steel.

2. 36 in. from centre to centre for both driving and truck springs.
3. 12 plates, with 14,000 lbs. on each driver.
4. 16 plates, with 34,000 lbs. truck wheels.
5. 4½ in. free and 2 in. loaded.
6. We would insist on the same size of steel for all classes of engines, whenever it is possible, and regulate the capacity by the number of plates.
7. The slot; because the width is generally too limited to permit using a stirrup without cutting away the sides of the spring.
8. Placing the bands on hot and upsetting with machinery or sledge and flatter and cooling rapidly. Prefer iron 3½ × ⅝ in. on top and sides, and ¾ in. thick on bottom, for both driving and truck springs, and would not recommend making bands wider at bottom than at top.
9. Have not had any experience with bandless springs, nor have we the experience of others, and have no recommendations to make.
10. A solid bar with slotted ends and centre for hangers and post, a steel gib through the hangers and post, also the frame slotted to allow the post to pass through, with steel gib on under side of frame. Prefer this as cheaper and less liable to give trouble from breakage of bolts.
11. Two bars 4½ × ¾ in. as per fig. 3, plate 2.
12. We have had but two replies, and the Committee make no report or recommendation.

An improvement in engine and tender springs is worthy of your consideration. We refer to the "V" shaped band, shown in fig. 4, plate 2. A full size spring embodying this improvement will be exhibited at the convention by the A. French Spring Co., who manufacture this style of spring, and have some in service. The claims are that the bands are wider next to the main plate and narrower next to the short plates. It is an established fact that the inclination of the main plates is to leave the outer ends of the band in attaining toward a straight line, thus relieving the pressure of the band on the main plate, while the short plates are forced against the bands, rendering them liable to breakage. With less width of band on the short plates, pressure is thus decreased, an easier and increased motion is imparted, and liability of breakage consequently reduced. The cost is not increased nor the carrying capacity reduced, and if the maker's theory is correct, it seems a more durable spring is secured. We present the subject as a new idea in the manufacture of engine and tender springs for your consideration.

JOHN MACKENZIE,
WM. SWANSTON,
J. S. PORTER,
} Committee.

The report on thick tires was then read and the convention adjourned till Thursday morning.

REPORT ON TIRES—THE ADVANTAGE OR OTHERWISE OF USING THICK TIRES.

The committee appointed at the St. Paul convention, 1887, to investigate "Tires—Advantage or Otherwise of Using Thick Tires," report as follows:

The following circular was issued to members:

"There are two methods of determining the relative value of thick as compared with thin tires. One is by making tests of the density of a number of specimens of each from the same maker, to determine whether the soft core is proportionally larger in one than the other. This method is misleading and cannot be accepted as conclusive, since it has not yet been definitely established whether the rolling friction desired may not be greater in a soft tire, nor does this method take into account the elements other than relative density which cause abrasion of the tire surface, as the frequent use of sand, slip incident to curves, slipping on grades, over-cylindered engines, etc. The other is the crucial test of daily wear, and includes all the causes which combine to wear the tire. To make a reliable comparison of these values the committee requires tabulated information showing the mileage made during the lifetime of a series of heavy and light tires of same makes, which the committee requests you to furnish on blanks similar to the one herewith sent you. * * * *

"The name of makers and comparative value of different makes of tire, will be regarded as strictly confidential between makers of the report and the committee."

The committee expected by compiling the tabular statements to be able to show whether the larger soft core in the central part of the thick tires wears away more rapidly than the relative smaller core in the thin tires. As no 4-in. tires are reported upon from the time of application until removed, the Committee is unable to give as definite information as it might have done if it had received reports from a large number of 4-in. tire showing the wear of same during their lifetime.

The principal basis from which a report can be framed will, therefore, be to show the mileage made by the outer part of 3-in. tires, as compared with the central part after first, second and third turnings.

The tabular exhibit herewith given has been prepared with this object in view. The extremely contradictory experience of different tire under the general conditions of wear make it apparent that other causes than the character of the steel of which the tire is made, or its relative density, very largely determine the mileage obtained from any thickness or brand of tire.

The following replies have been received in answer to the questions:

Does additional weight increase the adhesion to any appreciable extent or decrease the use of sand? All reply "no," except J. W. Hill, who says "the increased diameter decreases the amount of sand used." Mr. Clem Hackney: "Four inches finished is now our standard thickness for all new tires put on, but so far we do not find their use appreciably reduces the quantity of sand used."

C. E. Smart: "The use of heavy tire does not increase the adhesion of the engine so as to appreciably reduce the quantity of sand required."

To the inquiry as to the influence whih the engineer exerts on the wear of tires:

T. B. Twombly: "A careful comparison of records shows that the slipping of wheels is one of the most important elements in the wear of tires."

C. Hackney: "The manner of handling the engine, especially when in switching service, has considerable effect on the life of the tire."

C. E. Smart: "By careful handling and judicious use of sand a careful, competent engineer can and will reduce tire wear fully 25 per cent. over the engineer who takes no particular interest in his work except to draw his pay." Francis R. F. Brown, D. Drummond (Caledonian), G. W. Stevens, H. Schlacks, Jas. W. Hill, Wm. Swanston, J Davis Barnett, T. W. Gentry and John Player indorse this view.

Is it advisable to increase the weight of wheel centres to gain adhesion? T. B. Twombly, John Player, C. Hackney and C. E. Smart do not consider it advisable to increase the weight of driving-wheel centres beyond the weight necessary for strength and durability, but consider it highly advisable to put the requisite weight where it will be relieved by springs.

Mr. C. E. Smart further submits a comparative statement showing actual wear, etc., which is herewith submitted, and is a very important part of this report. From this it may be seen that imperfect designing of wheel centres where in unnecessarily great masses of iron are irregularly distributed may cause hammering and may show wear upon the tire, for which the tire is not in any measure responsible but which may easily mislead.

T. W. Gentry: "Not advisable to increase the weight of driving wheel centres beyond the weight actually necessary for strength and durability, but many builders and designers make the main and crank hubs too light. All weight added to increase the adhesion should be placed where it would be relieved by springs, and that it consist, when possible, of large heating surface and increased size of boilers."

J. Davis Barnett: "Make the wheel just heavy enough for strength and have all other weights where it would be transferred to the wheel through the elastic medium of a spring, because all inference drawn from experiments on the transfer of motion through friction wheels compressed together is in favor of the supposition that the surface contact between tire and rail is increased by the use of a spring; this is due to the wheel closely following the inequalities of the track instead of bouncing from point to point."

Mr Wm. Swanston concurs with replies of majority and considers that the comparison of a few sets of tires is very misleading, and it is very difficult to account for the results that sometimes occur. He gives the following illustration: Two switching engines on his road, both built from the same drawing, with six driving wheels, 44 in. centres, cylinders, 18 × 22; weight on driving wheels, 82,000 lbs.; both went into service Aug. 25, 1885; both came into the shop for repairs in October, 1886. The record of the tire turning at that time was as follows:

Number of engine.	Original thickness of tires.	Th'ckn'ss after turning.	Miles run before turning.	Miles run to 1-16" wear.	Mak'r's name.	Per ct. of wear.
341	3"	2 5-16	42,707	3,883	A	51
632	3"	2 11-16	38,194	7,639	B	100

The attention of the manufacturers of tire A was called to this fact; also note that their tire was much harder to turn and took double the time in the lathe. They furnished another set of special make, much softer, but before we put them on the 341 had made 22,384 miles with the former tires with a loss in thickness of 5/16 in., or a mileage of 2,487 to the 1/16 in. The new tires were put on in June, 1887, and were in the shop in March, 1888; during that time they had made 21,168 miles with a loss of 1/16 in., or 4,234 miles to the 1/16 in. Engine No. 632 was also in the shop in March, 1888, and had its tires turned for the second time, with a loss of 7/16 in. to 51,454 miles, or 5,717 miles to 1/16 in. wear. The marked difference in mileage is difficult to explain, but is not altogether caused by difference in the quality of the tires. The engines are in the same kind of service, but in different yards, and No. 341 had a number of different men running it, while the 632 had but few changes of men. If in this case there had been a difference in the thickness of the tires it would be manifestly unfair to have given the thickness any credit.

C. E. Smart replies to the question of whether heavy tires are more likely to increase the hammer blow, "heavy wheel centres with thick tire do produce flat spots upon the tread of tire much sooner than light wheel centres and light tires."

The following comparative statement shows actual wear and flat spots on locomotive tire as between heavy and light wheel centres.

HEAVY WHEEL CENTRES.					LIGHT WHEEL CENTRES.				
Engine	Original thickness of tire.	Turning	No. of 16ths of an inch turned off for		Engine	Original thickness of tire.	Turning	No. of 16ths of an inch turned off for	
			Wear	Flat spots.				Wear	Flat spots.
	In.					In.			
2	3	First	6	2	220	3	First	5	2
2	.....	Second.	4	2	220	.....	Second.	8	3
2	.....	Third	2	2	220	.....	.....	..	..
9	3	First	5	2	221	3	First	8	3
9	.....	Second.	4	1	221	.....	Second.	4	3
9	.....	Third	4	2	221	.....	Third	5	2
13	3	First	3	3	222	3	First	4	1
13	.....	Second.	4	1	222	.....	Second.	6	3
13	.....	Third	4	2	222	.....	Third	4	2
252	3	First	5	2	223	3	First	5	2
252	.....	Second.	5	3	223	.....	Second.	6	1
252	.....	Third	3	2	223	.....	Third	4	1
253	3½	First	5	5	224	3	First	7	3
253	.....	Second.	2	1	224	.....	Second.	5	2
253	.....	Third	4	2	224	.....	.....	..	..
255	3½	First	2	2	225	4	First	5	2
255	.....	Second.	4	1	225	.....	Second.	6	2
255	.....	Third	2	3	225	.....	.....	..	..
Totals			68	38	Totals			82	31

Percentage of flat spots as to wear of tire on heavy wheel centres is about 56 per cent.

Percentage of flat spots as to wear of tire on light wheel centres is about 37 per cent.

Showing 19 per cent. difference in favor of the light wheel centre as to flat spots. The above statement is made without regard to mileage, and is only to show the supposed effect of a heavy wheel centre over a light wheel centre on tire.

It should be stated that the engines having the heavy wheel centres are about 10,000 lbs. heavier on their drivers than the engines having the light wheel centres.

J. W. Hill: "Heavy tires produce flat spots, unless the moving parts are balanced at the average speed."

This virtually assumes that the flat spots are caused by imperfect balancing in wheel centres.

Clem Hackney: "Thick tires do not produce flat spots on tread oftener than light tires."

T. W. Gentry: "Many who speak from experience claim that the hammer blow, or concussion from heavy wheel centres and thick tires, is greater than that produced by light forms, and that flat spots appear sooner and increase faster." The following statement of the wear of tires upon engines upon the Richmond & Danville railroad shows the part of wear for which the brake, and not the actual wear due to work, may be responsible, and shows the different effect of wear between large and small sized wheels. The effect of the Ross-Meehan shoe is also shown, as compared with the ordinary flat bar shoe. "Our road has maximum grade of about 70 ft.; average about 50 ft. Traffic consists of compressed cotton, fertilizers, coal, ores and merchandise. Has several grades over six miles long, average about 40 to 60 ft. Passenger trains are run fast (45 miles per hour) and make frequent stops. Freight engines average 34 loaded 40,000 lb. cars per train. The tire performance given below was made under the above conditions. Engines are 20 by 24 in. Baldwin consolidation type; total weight, 118,000 lbs.; weight on drivers, 104,000 lbs.; on pony truck, 14,000; weight of engine and tender, 175,000 lbs.; outside diameter of tires, 50 in.; average mileage of six sets of tires to first turning was 64,000 miles; original thickness, 3 in.; thickness after first turning, 2¾ in.; or a reduction in thickness of ¼ in., an average of 8,000 miles for each 1/32 in. of wear. Rail ordinary section 60 lb. steel. These tires would have made more miles, but were stopped on account of flanges wearing unevenly. They were also equipped with the ordinary cast iron brake head, with flat wrought iron shoe, or lines in contact with tire; rigged on American "outside" plan, using compressed air instead of steam for power. Several of these engines were equipped with Ross style of brake shoes after their first turning, and some with Ross-Meehan shoe. Some of the latter have made 70,000 miles and tires are not bad, though they need turning up and sizing. They are reduced about 5/16 in. since first turning, or a total reduction in thickness of 7/16 in. for 134,000 miles, or about 14,900 miles to 1/16 in. decrease in thickness.

At this rate these tires should make about a total of 417,200 miles, as we remove them at 1¼ in.; but as they wear faster after first and second turnings, they may fail to keep up this ratio. Tires were not turned on tread when first applied. Great care was taken to get them of one diameter, and as near as possible, and the flanges, back and outside faces were trued up and balanced. The actual mileage of many of the tires that are included in this lot would have been greater under ordinary conditions, some of them having been slid flat by reversing and applying driver brakes in emergency stops, which caused their truing up before they were much worn; but, as a whole, we consider it a fair average for this class of engines.

Following table gives tire wear on new Baldwin passenger engines, 18 × 24 cylinders; 60-in. and 66-in. wheel; engines weigh 90,000 lbs., 56,000 lbs. on drivers and 34,000 lbs. on truck. Engine and tender weigh 145,000 lbs. Engines equipped with Westinghouse driver brakes, and first mileage given in record below was made with the ordinary flat wrought iron shoe, while second was with Ross-Meehan shoes. The figures given are accurate, and show plainly the advantage of reducing tire wear by increasing diameter, and also show advantage of Ross-Meehan shoes over old style:

The engines with the 66-in. wheels ran same schedule over same road as those with 60-in. wheels, and time consumed in getting under way after stopping averages nearly same with both classes, *i. e.*, the smaller wheels slip easily and the larger ones do not, but hold and move off slowly:

	Original thickness	Miles run to first turning.	Thickness after turning.	Miles run to second turning.	Thickness after second turning.
60" tires	3"	48,000	2¾"	54,000	2⅝
66" tires	3"	77,000	2 11-16"	85,000	3 7-16

The Committee suggests that the information sought for is not yet as available as could be desired, and further suggests that master mechanics would do wisely, in view of the importance of the question of relative wear of tires, and of the greater economy which would be obtained by using thick tires if they were found to be as efficient in wear as the thin tire, to introduce the use of a tire gauge similar in operation to that used by Mr. John McKenzie for the purpose of computing averages.

If a committee could be furnished with sufficient data, it might be able to determine this question, but it could only be done with certainty upon the computation of a large list of averages; meanwhile there are continued improvements in tire manufacture, in progress, both in the nature of steel and in rolling, and larger engines are being required for the increased tonnage, and it would almost seem impertinent in the progressive state of steel tire making to attempt to fix a limit of size or durability in tires.

The Committee believes that this vital economic question should not be dismissed until a definite list of averages has shown to the satisfaction of all inquiry the true relative value of heavy tire in comparison with light, and suggests that the work of the committee be carried over or a new committee be placed to further the work herewith initiated, as it is evident that very few 4-in. tires have yet been worn out; such committee should be authorized to arrange for the use of the tire outline indicator, and have a number of them put into use where care and certainty of measurements would be assured. Thus only can its work be made permanently valueable.

J. W. STOKES,
H. SCHLACK,
C. E. SMART,
Committee.

The Mason Pump Pressure Regulator.

The accompanying cuts represent the outside and sectional view of a pressure regulator designed by the Mason Regulator Co., of Boston, for automatically controlling the pumps used for air brakes. It is well known to railroad men that it is desirable to maintain the pressure in the reservoir as nearly as possible uniform at the pressure found most effective for service, say 70 lbs. This is desirable not only to avoid skidding the wheels from over pressure, but to insure the prompt accumulation of pressure in the main reservoir, and also to prevent the pump being run unnecessarily or at unnecessary speed.

The Mason regulator here shown has some novel features. It is placed in the steam supply pipe to the pump. The steam enters at the inlet, holding down to the seat the main valve *P*, and passes up the passage *Z Z* into the chamber *I*. The auxiliary valve *F* is held open by the tension of the spring *B*, regulated by screw *A*, which is operated by a key. The team, after leaving the chamber *I*, passes through the valve *F*, along the port *X X* under the main piston *M*, which has twice the area of the valve *P*, which rests upon it. Piston *M* being twice the area of valve *P*, forces it from its seat, thus allowing the steam to pass through the valve *P* into the outlet, thence into the pump. When the pump has forced up the desired pressure in the reservoir it acts through a ¼ in. pipe, connected from the train pipe at *R*, into the chamber *K*, forcing up the phosphor bronze diaphragm *G* and the cricket *D D*, thus allowing the valve *F* to close with the aid of the spring *I*. Steam is shut off from under the piston *M*, and the

TABLE SHOWING WEAR OF TIRES—TO ACCOMPANY REPORT OF MASTER MECHANICS' COMMITTEE ON TIRES.

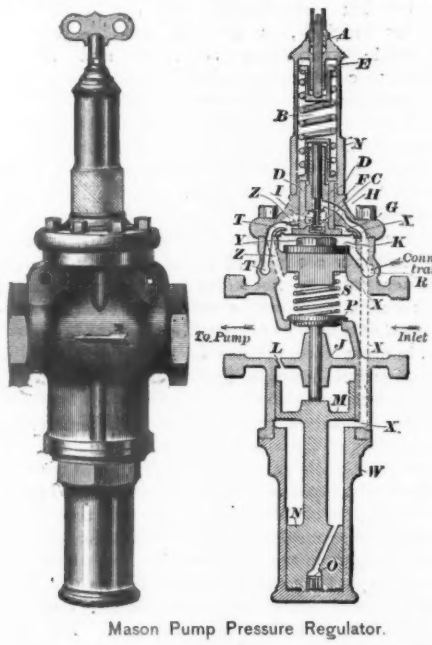
NAME OF ROAD.	No. of engine.	Kind of service.	Kind of driving wheel brake.	Brand of tire	Original thickness. Inches.	Miles run before 1st turning.	Thickness after 1st turning.	Miles run to 1/16 in. wear before 1st turning.	Miles run before 2d turning.	Thickness after 2d turning.	Miles run to 1/16 in. wear between 1st and 2d turnings.	Miles run before 3d turning.	Thickness after 3d turning.	Miles run to 1/16 in. wear between 2d and 3d turnings.	Miles run to removal.	Thickness at removal	Miles run to 1/16 in. wear between last turning and removal.	Total mileage.	Average miles run to 1/16 inch wear.
Lake Shore & M. S*	322	Freight	Steam.	A	3	19,481	2 35/64	8,470	71,974	2 1/4	8,997	59,649	1 3/4	7,456	88,700	1 1/2	14,783	205,911	8,863
" "	205	Switching	None	A	3	56,387	2 5/8	8,055	65,719	2	7,302	45,948	1 11/16	9,189	43,435	1 1/2	6,205	211,489	7,553
" "	299	Freight	Steam.	B	3	23,256	2 21/32	5,814	51,932	2 5/16	5,770	45,638	1 5/8	5,070	54,412	1 1/2	13,603	175,238	6,740
Grand Trunk	8	"	None	C	2 1/8	42,501	2 5/16	4,950	43,758	2	10,939	37,699	1 5/8	6,266	53,830	1 3/16	7,690	184,688	6,840
"	42	"	"	D	2 1/8	25,266	2 1/16	5,053	50,906	2 3/16	8,484	52,927	1 5/16	5,292	39,107	1 1/4	7,821	168,206	6,469
"	77	"	"	E	3	84,354	2 21/32	14,059	37,908	2 5/16	5,415	60,619	1 5/8	6,735	30,516	1 5/8	7,629	213,397	8,207
Lake Shore & M. S	85	"	Steam.	B	3	36,176	2 21/32	9,044	60,856	2 1/16	6,761	65,191	1 11/16	8,189	41,410	1 1/4	5,915	203,333	7,279
" "	468	Switching	Steam.	B	3	36,182	2 11/16	12,063	56,606	2 5/16	7,083	64,621	1 7/16	5,385	56,445	1 1/4	11,289	213,861	7,637
N. Y., Chicago & St. L	3	Freight	None	A	2 6/16	63,576	1 13/16	7,064	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	13	"	"	A	2 5/16	77,979	1 11/16	7,089	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	21	"	"	C	2 1/16	77,427	1 11/16	8,603	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	32	"	"	A	1 15/16	29,065	1 5/16	5,813	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	42	"	"	A	1 15/16	28,916	1 5/16	7,229	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	49	"	"	A	3	45,032	2 1/16	11,258	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	169	"	Air	A	2 5/16	51,928	2 1/16	12,982	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	175	"	"	A	2 1/16	52,484	1 15/16	13,121	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	38	"	None	A	1 15/16	55,096	1 5/16	13,774	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	38	"	Air	A	1 15/16	55,096	1 1/16	7,871	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	38	"	"	A	1 15/16	55,096	1	6,122	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	51	"	None	A	1 5/8	46,854	1 1/16	15,618	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	51	"	Air	A	1 5/8	46,854	1	7,809	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	62	"	None	A	1 15/16	54,720	1 1/16	10,944	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	62	"	Air	A	1 15/16	54,720	1 1/16	6,840	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	62	"	"	A	1 15/16	54,720	1 1/16	6,080	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	57	"	None	A	1 29/32	63,138	1 13/16	21,046	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	57	"	Air	A	1 29/32	63,138	1 1/16	10,523	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin Central	56	"	None	A	3 1/16	98,733	3 1/16	16,455	47,709	2 3/4	7,951	.....	.....	.....	.....	.....	.....	.....	.....
" "	57	Passenger	"	A	3 1/16	97,914	2 15/16	24,478	41,223	3 1/16	20,761	.....	.....	.....	.....	.....	.....	.....	.....
" "	100	"	"	B	3 1/16	57,637	3 1/16	9,606	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Peoria & Pekin Union	3	Switching	None	A	4	46,304	3 1/2	5,788	30,093	3 1/16	4,299	.....	.....	.....	.....	.....	.....	.....	.....
" "	4	"	"	A	4	46,656	3 5/8	7,776	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	5	"	"	A	4	42,976	3 1/2	5,312	42,918	3 1/8	7,153	.....	.....	.....	.....	.....	.....	.....	.....
" "	6	"	"	A	4	43,118	3 15/16	4,791	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	7	"	"	A	4	23,394	3 1/16	4,679	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	8	"	"	A	4	48,490	3 3/16	4,849	33,080	2 1/16	4,135	23,292	2 5/16	2,588	.....	.....	.....	.....	.....
N. Y., Chicago & St. L.†	18	Freight	None	B	4	39,932	3 1/16	19,966	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	38	"	"	C	4	26,450	3 1/16	13,225	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	38	"	Air	C	4	26,450	3 3/16	6,612	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	51	"	None	A	3 15/16	37,458	3 13/16	18,729	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	51	"	Air	A	3 15/16	37,458	3 5/16	12,486	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	62	"	None	A	4	22,718	3 1/16	11,359	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	62	"	Air	A	4	22,718	3 1/16	7,576	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	61	"	None	C	4 1/16	50,208	3 1/16	25,104	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" "	61	"	Air	C	4 1/16	50,208	3 1/16	16,736	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Peoria & Pekin Union	1	Switching	None	B	3	48,960	2 5/16	5,440	61,425	1 3/8	4,725	.....	.....	.....	.....	No	.....	118,477	.....
" "	1	2d set.	"	A	3	55,473	2 5/16	5,043	30,618	1 3/4	3,402	18,509	1 3/8	3,085	.....	r'c'd	.....	.....	.....
" "	2	"	"	B	3	.....	.....	.....	106,232	1 3/8	5,901	.....	.....	.....	.....	"	.....	142,287	.....
" " (one broke)	2	2d set.	"	A	3	43,296	2 1/4	3,608	39,784	1 3/4	4,973	.....	.....	.....	18,558	1 1/16	3,711	101,638	4,065
" "	3	"	"	B	3	.....	.....	.....	95,361	1 3/8	3,668	.....	.....	.....	.....	No	.....	.....	.....
" "	4	"	"	B	3	.....	.....	.....	119,357	1 3/4	5,968	.....	.....	.....	.....	r'c'd	.....	148,440	.....
" "	5	"	"	B	3	.....	.....	.....	125,537	1 1/4	4,483	.....	.....	.....	.....	"	.....	152,613	.....
" "	6	"	"	B	3	47,208	2 1/4	3,934	.....	.....	.....	.....	.....	.....	.....	"	.....	119,299	.....
" "	7	"	"	B	3	.....	.....	.....	128,596	1 1/2	5,358	.....	.....	.....	.....	"	.....	160,432	.....
" "	8	"	"	B	3	47,864	2 1/2	5,983	57,260	1 5/8	4,090	.....	.....	.....	.....	"	.....	137,670	.....
" "	10	"	"	B	3	.....	.....	.....	105,560	2 1/16	8,120	.....	.....	.....	.....	"	.....	105,560	.....
" "	11	"	"	B	3	135,676	1 7/8	5,653	.....	.....	.....	.....	.....	.....	.....	"	.....	.....	.....
" "	12	Pass. & F't.	"	B	3	.....	.....	.....	149,324	2 1/16	13,575	.....	.....	.....	.....	"	.....	149,324	.....

* Engine No. 322, L. S. & M. S., also showed 27,107 miles run before 4th turning; thickness of tire after 4th turning, 1 1/4 in.; miles run to 1/16 in. wear between 3d and 4th turnings, 6,527.

† All of the reports from the New York, Chicago & St. Louis Railroad were taken with the Mackenzie tire indicator.

valve *P* is forced on to its seat by the initial pressure, thus stopping the pump.

The pressure already under *M* exists around it and escapes through *L* into the outlet side of the regulator. The



Mason Pump Pressure Regulator.

piston *N* at the bottom acts as a dash pot, its object being to prevent sudden movement and consequent jumping of the pump. The passage *T T* is to afford an escape for whatever small leakage may have passed around the valve *F* and through the holes for the cricket *D D*. The distinguishing feature of this regulator is that the pressure chamber is entirely separate from all working parts, so that dust or any foreign matter from the air tanks will not disturb the working.

TECHNICAL.

The Rail Market.

Steel Rails.—The market continues dull, with quotations $30@$30.50.

Old Rails.—Quotations for tees: $20@20.50.

Tire Fastenings.—A large order for steel angle bars for Alabama delivery has been placed at 1.90c. Quotations: 2.@2.10c., delivered; angle-bars, 1.85@1.9c., delivered.

Electricity on Street Railroads.

"The solution of the Municipal Rapid Transit Problem" was the subject of a paper read before the American Institute of Electrical Engineers, June 19, by Frank J. Sprague. The actual operation of street railroads by electricity is bringing to view the obstacles which are to be overcome, and the success already attained leads Mr. Sprague to believe that municipal rapid transit is to be solved by the adoption of some system of electrical propulsion. It is his opinion that the data and experience obtained in the operation of the Union Passenger Railway in Richmond, Va., proves that electricity meets all the requirements for traffic of that character, while the grades are heavier and the curves sharper than will be encountered in most American cities. The Richmond road aggregates 13 miles of track through 9 miles of streets, and is operated from a central station, the power being derived from three 125 h. p. engines. The cost of running the cars is $1.98 for operating and $1.48 for station expenses, a total of $3.46 per car per day or 80-mile run. This does not include executive expenses, taxes nor general charges of that character. The overhead system he considered the best and most economical, and if properly constructed, has no objectionable features. For the operation of a similar surface railroad in New York City conductors could be advantageously suspended underneath the elevated railroad structure.

The paper was accompanied by numerous diagrams and views, which were thrown on a screen from a lantern, thus giving a very realistic idea of the appearance of the road, with its grades, curves and mud. About 200 people were present, including street railroad men as well as electricians, and President Edward Weston of the Institute paid Mr. Sprague a high compliment for his skill and perseverance in conquering success in the face of so many difficulties. Owing to the length of the paper, its discussion was postponed until the next meeting in September.

Breaking in New Cars.

The Lake Erie & Western, on putting in service 300 new freight cars of 50,000 lbs. capacity, marked them 40,000 and retained that figure for three months. At the end of that time, assuming that the bearings had run smooth and that the cars would haul more easily, the full capacity was marked upon them. The difference between 25 tons of lading and 20 would seem to be rather too small to be of great advantage, a loaded car containing 40,000 lbs. being only about 13 per cent. lighter than when loaded to its full capacity.

Car Heating Notes.

The Delaware, Lackawanna & Western has adopted the Gold system of car heating and the Gold coupling with the improved automatic trap. The road has ordered its passenger cars equipped as rapidly as possible in preparation for next winter, in compliance with the New York law, which goes into effect in November, 1888.

Models at the Glasgow Exhibition.

It is said that the collection of ship models at the Glasgow exhibition (we thank the Scotchmen for having an *exhibition* and not an exposition) is remarkably fine. The most interesting model shown is that of the "City of New York," lately launched by Messrs. J. & G. Thomson, and near it is displayed the model of a ship to be built by the Fairfield Co. for the Guion line. This latter vessel will be 560 ft. long by 63 ft. beam, and 52 ft. deep, will register 11,500 tons gross. It is expected that she will cross from Queenstown to New York in five days. *Engineering* estimates that the cash value of this collection of ship models must be as great as that of a "first class gallery of oil paintings." There are also shown some magnificent models of marine engines.

Electric Railroads.

In the following cities roads are now in operation under the Thomson-Houston-Van Depoele patents:

	Miles.		Miles.
Ansonia, Conn	4	Port Huron, Mich	4
Appleton, Wis	4.50	St. Catherines, Ont	6
Binghamton, N. Y	4.50	Scranton, Pa	5
Detroit, Mich	2	Wheeling, W. Va	5.25
Fort Gratiot, Mich	1 75	Windsor, Ont	1 75
Jamaica, N. Y	10	Lima, O	4
Woonsocket, R. I	4	St. Paul, Minn	10
Revere, Mass	4 50		
Montgomery, Ala	11	Total	82 75

There are also Thomson-Houston motors in use in Allegheny City, Pa., 4 miles, and in New York, 1 mile.

The following roads are building: Wichita, Kan.; Dayton, O.; Omaha, Neb.; Scranton, Pa.; Chattanooga, Tenn.; North Adams, Mass.; Revere, Mass.; Salisbury, Mass.; Syracuse, N. Y.

Premiums to Freight Conductors.

Twenty-six out of the 28 freight conductors on the Syracse, Geneva & Corning (Fall Brook Coal Co.) last week received the $60 premium which has for several years been annually promised by the superintendent to all men in this grade who show clear records for a year.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Some valuable data, showing the results of tests of chilled wheels, made for the Pennsylvania by a private establishment, have lately been published. Out of 1,788 wheels, 50 were taken at random and broken under a 140-lb. drop, falling 12 ft. The wheels were 33 in., weighing 560 lbs. on the average. The results of the drop test were:

	Blows to crack wheel.	Blows to break wheel in two.
Weakest wheel	12	20
Strongest "	70	120
Average "	24½	65¼

The endurance required was five blows of the same drop without breaking in two. It will be seen how far even the weakest wheel tested exceeded the specified endurance, and the tenacity of the metal is apparent. It is further stated that the depth of chill in any one wheel did not vary more than ¼ in., that not one wheel was found to vary in the tread $\frac{1}{16}$ in. from a true circle, and that 1,691 of these 1,788 wheels did not vary more than ¼ in. in circumference. It would be interesting to know the price at which these wheels were sold and the profit in them; but it is safe to say that they were made as a commercial transaction, and not as a fancy lot, and that they can be duplicated as often as any railroad company chooses to pay a reasonable price for them. It is also safe to say that if the railroad companies will insist on having such wheels and will accept none other, the American chilled wheel will regain its old-time fame. At this writing no report has reached us of the action of the joint committee of the Master Car-Builders', Master Mechanics' and Wheel Makers' associations, but we look for an important step by these bodies toward securing high and uniform tests and specifications. It will be a misfortune if they do not make the most of a time when interest is awake, and when joint action is possible.

When the Inter-state Commerce law was first passed it was thought that it would have a bad effect on the jobbing centres, which would suffer from having goods sent directly to the consumer. It was not supposed that this same effect would be felt by cities of the largest size. Yet such seems to be the case. The recent complaint of the Produce Exchange with regard to the treatment of export traffic shows how New York itself in certain cases may become no better than a way station. The same result is felt in another form at Chicago. It is said that "a copy of a resolution has been forwarded by Chicago dealers to every railroad centring in Chicago, declaring that the present custom of 'pro-rates' from Wisconsin, Minnesota and Michigan points to Illinois, Ohio and points southwest, south and east of Chicago, which are less than the local rates to and from Chicago to such points added, is disastrous to the Chicago trade, and requesting that consultation be had at once without association to correct such unjust discrimination against Chicago." Probably this complaint is exaggerated. We do not apprehend that Chicago will wholly lose its importance as a distributor of freight and be reduced quite to the rank of a way station. Nor is the loss to Chicago by any means without corresponding gain at the local points. The latter undoubtedly may quite generally outweigh the former. But the existence of troubles like this will teach people to be on their guard against expecting anything like unmixed good from the operation of the law. We cannot do better than to quote, in this connection, the words of the Inter-state Commerce Commission itself: "A railroad company may be rather a nominal than a real defendant, the rate, the classification, or the practice complained of may concern some class of its customers more than it does the railroad company itself." And the Commission elsewhere says that the question of rates is not so much one between the railroad and the body of shippers, as between different classes of shippers, or rival localities. The public is beginning to see the force of this statement. It is to be hoped that the Commissioners themselves will not forget it.

Some effort was made in the Master Car-Builders' Convention to delay the final action of the association as regards the adoption of a standard automatic vertical plane coupler for freight trains. The question, however, did not meet with any encouragement, and many of the Master Car-Builders present declared that not only would they be ashamed to return and meet their general officers with the information that they had hesitated in pursuing the course already determined after much deliberation, but stated that they were equipping, or were about to equip, a very large number of cars with the M. C. B. standard coupler. Mr. Schroyer, of the Chicago & Northwestern, stated, for instance, that his road had 26,000 cars, and that his officers proposed within a very short period to equip them all with the M. C. B. coupler. It seemed to be generally recognized that the use of this coupler can only be successful, and that the advantages to be derived from at can only be fully obtained when its use becomes general; and that the period of change from the common loose link to the automatic close coupler must be attended with considerable inconvenience, and should, therefore, be shortened as much as possible. Other members who, as yet, have failed to see the superior advantages of the principle of close coupling, with praiseworthy forbearance determined not to hinder the progress agreed upon by the majority of roads, and declined to countenance any further delay in the equipment of cars with the M. C. B. coupler.

The question at issue, and on which debate was made, is the proposed alteration in length of draw-bars. The length required by the M. C. B. Association, in 1879, was 28 in. The Executive Committee now suggests that this length be increased to 30 in. Several members urged that it was unwise to alter by so small an amount a standard largely followed by roads in all parts of the country, and that an increase in the length of the draw-bar would separate cars an additional four inches, and thus increase the danger of men falling between the cars. Mr. John McKenzie very aptly pointed out that while the cars would be farther apart when the draw-bars were touching or were driven "home," yet, owing to the absence of slack, the cars would be closer together when the train was stretched, and further, that in the majority of cars the proposed alteration in total length of draw-bar would not affect the existing method of attaching draw-bars at their rear ends, and that the lugs for carrying the follower plates needed no alteration. Some speakers, however, stated that a considerable alteration would be needed in the draft rigging and dead-blocks in use on their roads. These gentlemen proposed that the length of the M. C. B. automatic draw-bar be the same as the standard length recommended in 1879, giving a total length of 28 in. from end of head to first follower plate. The whole question appears to hinge on the fact that the vertical plane draw-bar projects farther from the car than the common draw-bar, and that a corresponding change must be made in the dead-blocks. As it has been determined to refer the matter to letter ballot, the question will doubtless receive the careful attention of railroad officers.

Safety of Trainmen.

The value of the report of Messrs. Kirby and Forney on appliances for the safety of freight trainmen, published in our last issue, lies in the plain statement of facts, coming from officers and employés of various grades, and in the evidence given that this subject is getting attention from those who are in a position to help matters. In spite of the almost universal carelessness and apparent contempt shown by those to whom circular inquiries are sent, the Committee has succeeded in drawing out expressions of opinion that will compel further attention. But it is rather discouraging to find that there are five master car-builders who are willing to have it recorded that they don't know of any "defects in the present construction of cars and locomotives which cause accidents to railroad employés by falling from trains, engines or cars, or accidents from getting on or off trains." Their fortunate experience is overbalanced by the detailed statements of other replies.

One of these which is especially suggestive specifies "the absence of means to get over coal cars." The 25 and 30 ton coal cars now so common are an important innovation on former methods. Their side and end boards are so high that brakemen call them unroofed hay cars, and getting over an empty one in the night with a lantern, when one is in a hurry, is no pleasant task. Coal cars run off the home road so much that the duty of investigating this point and doing whatever is possible to guard against accident to trainmen is incumbent on roads which own few or no high-side-board cars as much as on those who build them.

The facts about grab irons which are brought out in the report are also important. Aside from the question of safety, it is quite essential for good service that all appliances should give a brakeman that confidence in their security without which he cannot act promptly and efficiently. He does not often have time to make sure of every step, and he ought not to feel the necessity of it. The perversity with which grab irons are put on the sides or roof of a car, without any rational consideration of their relation to the position of the ladder, is no doubt the consequence of insufficient attention to what has seemed an unimportant detail, and probably it will not take much hammering by the Committee to improve the practice in this particular, especially as improvement does not call for added expense.

The proper fastening of ladders and grab irons, is a matter of even greater importance than their proper position, and this was carefully treated in the report, and intelligently discussed at the meeting. And it seems only necessary to call attention to and emphasize the sufficient recommendations of the Committee. Here, again, there would be a distinct gain in the additional confidence which the brakeman would feel if he could see the nuts with which ladders and grab irons were fastened, and know that his life did not depend on the holding power of a screw in rotten wood; and bolts would bother the contractors who are in the habit of driving in lag screws with a sledge. Of course there are objections to putting bolts in roofs, but the additional security to the men ought to outweigh them.

Perhaps the most important single appliance for safety in the present state of freight equipment is the extension of the running board beyond the end of the car. A brakeman finding a defective or suspicious-appearing ladder can sometimes avoid it, but passing from one car to another is a duty that cannot be shirked. The good work that has already been done in this direction has been a great boon to trainmen, but the practice of some roads is still somewhat unsatisfactory in that respect. A mere shelf, separate from the longitudinal running board (the shelf running transversely to the car), supported by brackets, is perhaps good and sufficient while everything is tight and sound, but is a weak construction—patchy and liable to dangerous derangement. The extension of the main running board is the simplest and best expedient, and the language of the official recommendation contemplates only that. The use of a bracket, as recommended by the Committee, is not an absolute necessity, and this recommendation is, indeed, ignored in practice by influential members of the Association. The roofs of cars whose drawbars are in good condition and no longer than is necessary, are not so far apart but that a good strong running board can be run out far enough without the aid of a bracket of any kind; and it is a question if, in every case, the use of lumber for running boards of proper strength and thickness will not be cheaper and more satisfactory than the use of brackets.

Still other details were considered in the report and the discussion, and all are worth careful attention. It will be a good while yet before the two great reforms in freight train practice, the use of continuous brakes and of automatic couplers, bring about the trainman's millennium, and meanwhile there will be enough inevitable dangers in the brakeman's work. Cars will ride roughly on their springs, and engineers will jerk trains; ice and snow are unavoidable, and the habit of danger makes men careless. All preventable dangers should, therefore, be avoided to the last possible degree. All these precautions cost little besides careful attention, and the report of the discussion at the convention indicates that those who have given the most thought to the subject are the most anxious to introduce good practice. The rigid maintenance of efficient inspection, which, of

course, is always necessary, whatever the practice otherwise, is, of course, a point on which we do not need to argue with our readers.

Continuous Steam Heating.

As might be expected, one of the most interesting discussions at the Master Car-Builders' Convention was on the subject of continuous steam heating. It seemed to be generally acknowledged that the results given by the various systems used were fairly satisfactory. It was also noticeable, that while no reference was made to the difficulty of heating cars should the engine be stalled or break down on the road, numerous speakers stated that they had made arrangements for keeping the cars heated while they were standing at stations, junctions and terminal points. It seems to be a very general practice to keep the cars warm throughout the whole winter, and to couple them up to a stationary boiler when the cars are standing and the locomotive is not available. None of the speakers appeared to have found any difficulty in carrying this into effect, while no complaint was made that the quantity of steam used in heating formed an appreciable tax on the steaming power of the locomotive.

Mr. Blackall, of the Delaware & Hudson, and other speakers, described the arrangements which they used for preventing the drip or condensation freezing on the track at stations, and it appeared that this objection to continuous steam-heating had been overcome by means of very simple appliances.

The principal difficulty mentioned by any of the speakers, appeared to be caused by condensation, and its subsequent freezing in and about the pipes and couplers, though this difficulty did not appear to be generally felt. One speaker recommended that the main pipe be placed near the roof, as his experience had led him to believe that in a very cold climate, difficulty would always be felt from the accumulation of condensation in pipes and couplings placed beneath the level of the floor of the car. He urged, and with considerable truth, that where the main pipe was near the roof, the whole course of the condensation was downward, always tending to keep the main pipe clear of water, and to maintain a free circulation throughout the length of the train. This, of course, is an important point, especially with long trains, for it is of the first importance that the circulation in the main pipe should be unimpaired. If the pipes in one car are blocked, that car only is affected, but if the main pipe is waterlogged the whole train is imperfectly heated and a high pressure is necessary to maintain any circulation. It seems, however, from the statements of various speakers, that even in a very cold climate it is perfectly possible to maintain a circulation with pipes placed in the usual manner, underneath the floor of the car.

The best arrangement for the main pipes, must, however, be determined before an interchangeable system of coupling can be agreed upon. So far three different methods of arranging the main pipes have been proposed. The method most generally used is one pipe in which the coupling is beneath the platform of the car, and the pipe itself is either underneath or a few inches above the floor; only one line of pipe being used. The second method, which has many points to commend it, is to use two lines of pipe forming a circuit running the length of the train; the steam from the engine running through one line of pipes to the rear end of the train and returning thence by another line of pipes to the tender. The third system which has been often proposed, and which has been largely used in Russia and the north-east of Europe, and is now being put in operation on the Chicago, Milwaukee & St. Paul, is the "overhead" system, where the coupling is placed near the platform hoods.

It is obvious that even if one particular form of continuous steam-heating coupler were in general use, cars piped on these different methods could not be readily interchanged. A car with one line of pipe could not be readily coupled with one with two lines of pipe, and though it may be possible to couple two lines of pipe in one coupler having two passages, a car with a coupler underneath the platform could not be coupled to a car where the coupling was some 7 ft. higher. This question of a uniform interchangeable coupler will doubtless receive considerable attention, for its importance was very fully recognized by all the speakers at the convention.

But little was said in the discussion about traps, but some valuable information on this point may be found in a table accompanying the report of the Master Car-Builders' Committee on Steam-heating.

It appears that in a great number of cases, traps have not proved satisfactory, though they are in general use; for out of 32 replies to the question as to the manner in which the water from condensation in main steam and in heating pipes is disposed of, 26 replies stated traps, three stated that it is returned to the locomotive; two use a reservoir under the car, and one uses drip valves with a small opening.

Traps, as stated above, were used in 26 cases; but in 10 the results were unsatisfactory; in 12 cases the kind of trap that gave the best results is named, but no note is made as to whether its performance was absolutely rather than comparatively satisfactory; in three cases no information was given as to the manner in which the trap acted, and only in one case is it specifically stated that a trap acted in a perfectly satisfactory manner. One reply states "no trap found reliable; expansion rod found most desirable." This kind of trap appears to have been in most general use.

One of the most difficult problems in continuous steam heating is the regulation of temperature. The table appended to the committee's report shows that this is in nearly all cases effected by valves. In reply to the question whether these valves required constant attention, 29 replies were received. In 12 cases little or no attention was required; in 12 other cases the amount of attention required is not very definitely stated, and 5 replies state positively that constant attention was required. In one case the regulation was automatic and had required no attention in three months. The comfort of railroad traveling would be immensely increased if a tolerably even temperature could be maintained by some simple and efficient apparatus, easily understood and not likely to get out of order. It is, however, very desirable that the regulation of temperature should be accompanied by some improvement in the ventilation of cars. Few systems of steam heating seem to have made any provision for ventilation, though the discomfort and ill health produced by foul air, no doubt, exceed all the bad effects of riding in a cold car. The discomfort of a low temperature is at once recognized, and the cause of it is apparent; therefore, cars are seldom inadequately heated. But the effects of bad air are more subtle, its existence is not so obvious, and inadequate ventilation is not only common, but it is, we may safely say, the rule. It is to be hoped, therefore, that the subject will receive more attention from the makers and inventors of systems of steam heating. The introduction of steam pipes in a car gives an excellent opportunity for admitting and warming a plentiful supply of pure air, and this fact should not be lost sight of amid the various difficulties attending the introduction of a reasonably perfect system of continuous steam heating.

Lessons from the British Blue Books.

One of the most noticeable features of the English inspectors' reports on train accidents which we summarized last week, is the careful inquiry which in each case is made into the hours of duty of the men involved. If a switchman derails a train or an engineman runs past a danger signal, and, in fact, in any apparent lapse of memory, if the delinquent has been working more than a very reasonable number of hours, the management of the road is admonished in a most pointed manner. This practice of the inspectors is good, and American commissioners should give more attention to this point; but superintendents should bear in mind that this is a matter in which their own duty is important, and one in which government officers or even government laws can do little more than give a warning. Trainmen, in some cases, have an agreement with their employers that they shall not be called for duty at any time when they have had less than a certain number of hours' interval for rest since last leaving work, and, if we mistake not, England has a law on the point. We know of few, if any, agreements of the kind in this country on the part of any employés except enginemen. There ought to be no necessity for one among any class. It is as much to the interest of the road as of the men to have the thinking necessary in train work done by clear heads.

When a train master has several yards crowded with cars ready to be moved, he is strongly tempted on seeing a crew go off duty not very tired to offer them the temptation of an extra day's pay to go out immediately with another train. But it ought not to be very difficult to systematically resist this temptation to ask men to work when they ought to sleep. Like making rules limiting speed, while at the same time telling the engineer that he "must get there," this is a clear invitation to the men to violate the letter of the regulations. Unless the benches and cushions in the caboose are harder than any we ever heard of, the men will take turns in "pounding their ear," if indeed they do not all take a nap at once, where there is a favorable piece of road. And even engineers and firemen yield to this temptation sometimes. Collisions caused by dozing runners still occur, notwithstanding the marked improvement that has been made in the past ten years. Superintendents often seem to forget how easy it is to go to sleep on a freight engine. There are, on nearly every road, stretches of easy running where keeping a lookout is monotonous, especially at night; and if the runner is greatly fatigued he can easily "drop off" for a few minutes. It was a well-known fact 25 years ago that one could take a nap on horseback, if not while walking. The seeming improbability that a man would risk his life by relaxing vigilance in such a situation is, again, a point on which it is easy to form a wrong opinion. The careful superintendent will bear in mind that when he places dependence upon this consideration (that his runners will be vigilant because their own lives are at stake), he must allow for exceptions. The English runners who disregarded danger signals were old and trusted employés. The same holds true here.

But the trainmaster must be on his guard in two directions. He must not only resist the temptation to call on men who are just going off duty to go out again (because he has them there close at hand, and can save the trouble of hunting up fresh men), he must also keep close track of his men to see that their habits are fair. Only the other day a butting collision occurred in Connecticut from the drowsiness of a freight runner who had been on duty only about six hours. It is not easy in cases of this kind to discover the real extent of the blame. If the man has been carousing he is likely to claim that he or one of his family has been sick, or to tell some other lie. The engineer who gets up at four o'clock in the morning and does a day's hard work in his garden may not be fit to start out with a limited express at 11 a. m. On a hot summer morning he may by this action be virtually defrauding his employer. A lawyer would not think of that sort of a preparation for making a strong plea in a critical case, neither would a racehorse be placed in an important contest after excessive preliminary work. And yet the engineer needs wits as bright as the lawyer's, and frequently gets himself and his employer into trouble because he is not in a condition to summon them. His are the brains and nerve of a racing steed every day. A railroad has a right to some knowledge of what its men are doing when off duty.

The lack of uniformity in continuous brakes on passenger trains, and in some cases the lack of an effective train brake of any kind, is a subject of criticism in the reports of the British inspectors, and occurs quite often. The roads of the United Kingdom have, indeed, 90 per cent. of their passenger train cars fitted with some kind of brake, or at least with pipes to transmit power to cars in the rear, but the record shows 26 per cent. of the vehicles without brakes and 5,000 without even pipes; and the very prevalent practice of running passenger cars through from one road to another interferes still more with the proper making up of trains, so that the reader of the report becomes quite familiar with trains which have but 10, 20 or 30 per cent. of their weight properly braked.

International Competition and Steamship Subsidies.

A correspondent, whose letter we publish in another column, discusses the question of Canadian competition at some length. He disposes of Mr. Nimmo's argument for discriminating duties, but suggests in its stead a plan which seems to us equally undesirable —a system of subsidies.

It is true that the British authorities have subsidized both the Canadian Pacific and the connecting steamship lines, and thereby diverted transit trade from San Francisco. But before following their example it is worth while to inquire whether it was a wise one; whether a profitable trade is likely to be preserved or attained by these means.

The traffic in question is that from the East to the Atlantic, and especially to Europe. It is competitive in the highest degree, having the choice of routes *via* the Suez Canal on the one hand, or across America on the other. The field is already occupied by two subsidized British lines. What justification is there for an American subsidy in this case? It would encourage the investment of capital in a field already overfull, the worst policy for all parties concerned. A subsidy is perhaps justified as a means of developing new traffic, where the field is underworked and needs more capital for its profitable cultivation. To give subsidies where the field is overworked is the very reverse of what is needed.

That the field is overworked there can be little

doubt. Long distance sea freight is not as profitable as it once was. The telegraph has killed the chance for large gains in this way by equalizing prices and supplies in different markets. Profits have been still further depressed by the action of various governments with regard to subsidies. Each has desired to have a large marine of its own. Boats have been built for the subsidy rather than for the chance of legitimate trade profits. Once built, they have competed desperately for an amount of business hardly sufficient to maintain them. In no branch of transportation are the rates lower than in long-distance water freights; in none was the recent industrial depression more severe than in shipping and ship-building. It does not seem wise to invite American capital, by a system of subsidies, to participate in this loss.

Two counter-arguments may be urged to break the force of this reasoning. The first is the necessity, for American trade, of maintaining an American marine in the Pacific. This argument is not so strong as it looks. It is constantly said that "trade follows the flag;" but facts by no means bear out this statement in its most sweeping form. Both for American trade and American influence the addition of a few effective ships to our navy, which could make our power respected in foreign ports, would probably do quite as much as any addition to our merchant marine; while in the event of a war they would be a source of strength instead of weakness and a most positive gain to the country's resources.

The other argument is that we are bound to protect our capital which is already invested in steamships and railroads competing for the Asiatic trade. It is not easy to see how we can do this without encouraging the very investment of new capital which we wish to avoid. It must be remembered that the last fifteen years have seen a revolution in steamship building even greater than that which has taken place in railroad transportation methods. Steel has been substituted for iron, compound engines for simple, carrying capacity has been enlarged in proportion to fuel consumption. In fact the very rapidity of these changes has been a chief factor in making the steam carrying trade unprofitable; each successive standard of marine architecture having been so rapidly superseded by others, the depreciation allowance proved totally inadequate to meet the existing state of facts. No country has been able to protect its old capital in this business, because new and cheaper methods have come so rapidly to the front. Nothing is so futile, whether for a trade-union or a government, as the attempt to support the old machinery and old methods in the contest against the new.

We stand face to face with an awkward dilemma. If our subsidies encourage the investmeut of new capital, we are in danger of throwing good money after bad for the sake of gaining a share in a trade which is not likely to be profitable under the most favorable circumstances. If, on the other hand, we simply try to protect the old capital, we are not merely fighting against British subsidies, but against the effect of modern improvements in steamship economy; a much more formidable power to contend against.

Our past experience with subsidies in the Pacific has been by no means encouraging. Twenty-five years ago the Pacific Mail was a thoroughly sound concern. The subsidy of 1865 encouraged speculation. The loss to the company, due to the attempt at showy rather than conservative management, far outweighed any gain from the subsidy itself. The history of the ten years succeeding is a story of loss of vessels in the Pacific, and loss of character in New York and Washington. The revelations of official corruption connected with the movement for an increase of the subsidy so shocked the public mind that nothing more was heard of the project for many years afterwards. Only as these things are gradually forgotten is the proposal again revived.

One thing our steamships and our railroads have a right to claim against their British rivals—fair play. Our ships should not be subjected to special taxes; our railroads should not be hampered by special restrictions in the matter of rates. This is the great danger which we have to fear at present. Legislators do not see the exceptional condition to which international rates have been reduced. They clamor that such rates should be made the standard for national and local ones. As a final measure, they would perhaps refuse to let our carriers participate in such traffic, unless they are ready to make corresponding reductions in intermediate rates. Instead of subsidizing people to go into an unequal fight, it would surely be more logical to try and make things equal for the American representatives who are in the fight at present, by relieving them of restrictions which are a positive hinderance in their competition with British rivals.

The Railroads of the World.

For five years past the editors of the *Archiv für Eisenbahnwesen*, the official railroad journal of Prussia, have published careful estimates of the world's railroad mileage at the close of each successive year. These figures are by no means prompt. Those for the end of 1886 are only just issued, but they are remarkably accurate and well arranged.

The figures for 1882 and 1886 are as follows (we give them first accurately in kilometers, and then approximately in miles):

	Kilometres.		Miles.	
	1882.	1886.	1882.	1886.
Europe	177,819	201,053	1 1,200	125,700
America	212,621	265,661	132,900	166,100
Asia	18,173	24,384	11,400	15,200
Africa	5,169	7,259	3,200	4,500
Australasia	9,521	14,148	5,900	8,800
Total	423,303	512,505	264,600	320,300

In each case America has a little more than half the railroad mileage of the world, the percentage being slightly greater in 1886 than in 1882. The percentage of increase for the whole world during this period of four years has been 21.1. In Europe it has been only 13.1, in America 24.9, in Asia 34.2, in Africa 40.1, while in Australasia it is 48.6.

The increase each year has averaged about 14,000 miles, and has not varied very much from year to year; not rising as high as 16,000 in 1886 (its maximum), and hardly falling below 13,000 in either 1883 or 1885. The year 1887 will, of course, show a great change in this respect.

Of European countries of the first rank, by far the greatest relative increase was in Italy, whose mileage was 24 per cent. greater in 1886 than in 1882. Austria and France also show considerable percentages of increase, while that of Germany is much smaller, and that of England a mere trifle. Since 1884 France has had for the first time more railroad in operation than England—both absolutely, and in proportion to its population. The railroad mileage and population of the different countries at the end of 1886 was in round numbers as follows:

	Mileage.	Population.
Germany	23,900	47,100 000
France	20,800	38,200,000
Great Britain	19,400	37,100,000
Russia	17,100	87,500,000
Austria	14,600	41,000,000

France, Great Britain and Germany, each has something over 5 miles of railroad to every 10,000 inhabitants; Austria about 3½ miles, and Russia a trifle less than 2 miles. On the other hand, the United States has 24 miles for every 10,000 inhabitants, and Australia 26 miles. If we make the comparisons with area instead of population, the order of the results is to a large extent reversed.

The capital invested in the railroads of the world is estimated as follows:

Europe	$14,400,000,000
Other continents	11,70),000,000
Total	$26,100,000.000

The Block System on Single-track Roads.

A communication printed in another column, referring to the block system employed on the Canadian Pacific (described in the *Railroad Gazette*, Dec. 2, 1887, p. 780; see also Dec. 23), states that the Chicago, Milwaukee & St. Paul deserves credit for introducing a similar system in 1883. We are only too glad to give the credit to M. and his enterprising fellow officers, and regret that in his modesty he should have thought the interesting experiment not worth talking about until he was fairly nagged into saying something. The Canadian Pacific still deserves compliment for the great merit of not hiding its light under a bushel.

From our correspondent's letter we infer that nothing more than an experimental or temporary use of the blocking system was made on the Council Bluffs division. The practice on the La Crosse division is certainly of interest, and deserves the attention of all wideawake superintendents. Like the scheme in use on the Louisville Bridge, it is of the nature of a staff system with the staff and its disadvantages left out. The statement that the protection afforded by the dispatcher's care and that given by the blocking arrangement are entirely distinct is true in a sense, and yet it should be borne in mind that the same operator is depended upon (at a way station) to carry out the provisions of both systems. The use of a special wire is an excellent feature, and must aid the operators in keeping the idea of the block system distinct in their minds.

That the telegraph ought to be used much more than it is for the protection of trains there can be no question. Every winter there are widespread storms, and other conditions resulting from snow, which increase the danger to trains from rear collisions to a degree that ordinary flagging rules are not sufficient to provide against. In many localities and circumstances rain storms occur which demand similar extra provision. Many roads with steep grades are every week, if not every day, running heavy freight trains over them with crews so small that the liability to disaster from breaking in two and from trains eluding control constitutes a danger of considerable importance. These elements of danger, and many others, require greater provision for safety than is ordinarily found on lines where the business has grown faster than the operating organization. This, we take it, is so well recognized that operating officers on single track lines will be greatly interested in the details of the system of which M. writes. Another aspect of the subject is in its effect on the enginemen. One important factor in securing a careful and reliable corps of engine men is to give them confidence in the road they run on. The runner of a fast night train needs, at switches and junctions, not merely the absence of danger signals but the *presence* of an all right signal. On the same principle the runner of a snow plow should not be left to strain his eyes watching through the blinding storm for a red flag. He should be given a signal that will *assure* him of a clear road to a certain point. This can be done only by the aid of the telegraph, and for most of our roads the plan of the C., M. & St. P. is the most feasible one. To make this plan available in emergencies it must be used often enough to familiarize the men with it. If put in operation only once or twice a year it must of course work clumsily. To use it for a part of the trains and not for the rest introduces an element of danger.

Moreover, there is need for great caution in introducing any scheme of this sort. Even the most perfect form of block signaling, as used in England and on some roads in this country, is not free from liability to danger. Only the most rigid rules, strictly enforced, will suffice to get the best results out of the system. Permissive blocking, letting trains follow one another between block stations, leaves a chance for rear collisions nearly as bad as under old-fashioned rules. Using a block system and at the same time retaining the ordinary rules in regard to flagging certainly involves weaknesses in principle even if it has shown some favorable results in practice. It is hard enough to make flagmen go back when there is a strong probability that no train is following. When they can feel, on the authority of the rules of the road, that there is a *certainty* that nothing will run into them it must be still harder. On a certain road which uses the block system it is said that the engineers have come to pay scant respect to torpedoes. They encounter them frequently, but on the authority of a clear semaphore, which has just told them that the preceding train is a certain distance ahead, they keep right on without even shutting off. Certainly such a state of things as this needs careful scrutiny. In fact, the best of systems and all systems require constant inspection. The superintendent of one block signal line recently detected among his signal men, a scheme to save a little work, which was so cunningly arranged that it took a week or two to ferret it out, and this excellent system of the Chicago, Milwaukee & St. Paul and of the Canadian Pacific is no exception to the rule that eternal vigilance is the price of every thing worth having.

Detroit, Lansing & Northern—

	1887.	1886.
Miles operated	268	268
Earnings, freight	$704,336	$802,008
" passenger	389,611	364,778
Total, including misc	1,147,160	1,276,536
Operating expenses	696,115	727,819
Net earnings	451,045	498,717

This was sufficient to pay interest charges of $273,696 and $175,500 of dividends, (7 per cent. on preferred stock), but it left practically no surplus above these payments.

The decrease in earnings was due partly to a bad wheat harvest, and partly to lower freight rates—1.583 cents per ton mile in 1887, against 1.657 cents in 1886. The reduction in operating expenses, we are sorry to say, was due to economy in maintenance charges. Transportation expenses increased $10,000 in spite of the reduction in freight traffic. The report speaks most discouragingly of the effect of the Inter-state Commerce law upon the present position and prospects of the road.

Those who have been interested and personally active in promoting the organization of a National Bureau of Harbors and Waterways, as the beginning of a rational organization of our whole public works system, are fortunate in getting Senator Cullom interested in their work. He is not only a man of power, but, what is quite as important in such a work, he has the gift of zeal. He believes in things, and believes in them so thoroughly that he cannot help proselyting. It is a great gain for the public works reformers to have the help of his influence and knowledge of affairs, and to have his active advocacy. In the *Forum* for May appeared a paper by Senator Cullom on "Appropriations for Public Works," in which he presented the arguments with which our readers are familiar, for a change from present methods, and presented them with a candor which must have made some of his colleagues in both Houses squirm. The paper is an excellent popular summary of the matter,—brief enough to be read through by those who are not greatly interested, but comprehensive and impressive; and it cannot fail to stimulate popular interest in the subject. This in itself is a great help. The men who have been pushing the reform have had years of uphill work, and the most discouraging fact that they have had to face has been the fact that what little popular interest has been felt in the matter has mostly been dead against them. The lively interest has been amongst those who had axes to grind, or personal ends to serve. Those who cared first for the public good have been very few in numbers or very languid.

The New York, New Haven & Hartford announces that it will, on June 25, revise its time-table of express trains between New York and New Haven on a plan which is somewhat novel for so long a route. Trains are to leave New York on even hours, between 8 a. m. and 5 p. m. inclusive. The most important change will be made in the fast express train via the Boston & Albany, which now leaves at 4:30, and will be changed to 4. From the list of trains shown on the present time-table it would appear that there will be few changes and no additional trains. The Shore Line express is to be started at 11:30 p. m. instead of 11. The lines between New York and Philadelphia run frequent trains, but not on even hours. The benefit of the New Haven road's new plan, which consists principally in its being easy to remember, thus obviating frequent reference to the time-table, can be fully enjoyed only by travelers to New

Haven proper, as the stops made at the important points between there and New York are not at all uniform by the different trains. To find what hours one can go to Bridgeport or Stamford necessitates reference to the table as before, and to go to Boston one has to look up which one of the three routes beyond New Haven a given train will take.

On another page will be found a letter from Mr. A. Hardt, who sends us an interesting sketch of the life of Mr. John Magee, and of the addresses on the occasion of unveiling a monument to his memory. The memorial consists of a bronze bust 4 ft. high, resting upon a pedestal of Quincy granite 10 ft. in height. On the four sides of the latter are bronze tablets, two of them containing appropriate inscriptions, one a view at the Antrim coal mines, and one a locomotive and train of cars. The bust and tablets were from models by Samuel Conkey, of New York City. The project of erecting this monument originated with the employés of the Fall Brook Coal Company, in Tioga County, Pa. Mr. Magee's character, as described by those who knew him best, was not simply that of an honest, sagacious, courageous and enterprising business man; he was a kind master and a liberal employer, and enjoyed the affection and regard of the poor as well as the rich. He was a soldier in the war of 1812, then a public officer, member of Congress, bank president, projector of railroads and founder of the Fall Brook Coal Company, which now employs 1,000 men, and has 250 miles of railroad employing 1,500 more.

We, of course, were not unmindful, in writing of the Potter statue two weeks ago, of the numerous distinguished men like Mr. Magee that this country has produced. The distinction accorded Mr. Potter's memory is noteworthy because its basis lies wholly in his career as a railroad *manager*. He was not a capitalist in the ordinary acceptation of the term. He did not have the free scope enjoyed by one who is administering a business of which he himself is the sole or controlling owner. He was a *professional* railroad man, as are many of our best officers now living, and to us the chief significance of the movement to honor his memory with a statue is that he achieved distinction strictly in the line of this great new profession.

The members of the two conventions have had a very pleasant time at the Thousand Islands, fishing, excursions and picnics on Well's Island, etc., occupying the time not devoted to the more serious business of the convention. On Sunday evening a service of song was held in the Thousand Island House, and Mr. William M. Martin delivered an eloquent address, while Mrs. McGuire, Mr. McElroy, Mr. Nourse and others contributed some fine singing. Mr. Giles delivered a lecture on the Magnetism of Watches, and elucidated his subject with some fine stereopticon views. The hall in which the Master Mechanics' Association met was very prettily decorated with flowers, flags, etc., chiefly by the exertions of some ladies whose handiwork was much admired.

Although there are confusing views concerning the new Iowa freight rates (which are printed in our traffic column), we gather that conservative railroad men are really alarmed, the rates prescribed for the larger roads being about 30 per cent. below those now in force. They say that the Commissioners paid but little attention to their protests. Our Chicago advices indicate that Northwestern rates are now merely nominal, each road really making what concessions it deems necessary to obtain business. The rush to the Convention at Chicago taxed the capacity of the St. Paul lines, so that they have withdrawn some of the very low cuts in passenger rates that were offered.

NEW PUBLICATIONS.

Tables for Field Engineers. By Amos Stiles, C. E.; D. Van Nostrand, New York. $2.

This little volume has been designed solely for the handy use of engineers in the field, and there is no mathematical demonstration nor any attempt to ground the reader in the principles. Three tables are given, prefaced by a few pages of examples and propositions to illustrate their use. Table I. gives the radius; 6-place logarithm of radius; the tangential offset, and the middle ordinate, for each "degree of curve," by single minutes up to 12°, by two minutes up to 23°, by 10 minutes up to 41°, and by 30 minutes up to 51°.

Table II. gives the chords, versed sines, external secants and tangents to a 1° curve for every minute of central angle up to 90°.

Table III. gives natural sines and tangents, to seven places of decimals, for every minute of the quadrant.

The whole volume contains but 156 pages, and it is a remarkably compact and convenient little book for the uses for which it is designed.

The second of the *Scribner's Magazine* railroad papers appears in the July issue. It is entitled "Feats of Railway Engineering," and is by Mr. John Bogart, Secretary of the American Society of Civil Engineers and State Engineer of New York. Mr. Bogart writes entertainingly of remarkable performances in location, construction and bridge work, and the paper is beautifully illustrated. The pictures are better drawn, more pertinent to the matter and better executed than those in the first paper of the series. The remarkable examples of construction include, of course, the well-known Colorado lines, the St. Gothard and the Oroya, and among the bridges are the old and new Portage viaducts, C. Shaler Smith's Kentucky River cantilever, the Niagara suspension and cantilever bridges, the St. Louis and Brooklyn bridges, the new Harlem bridge, and a number of others, all familiar to most of our readers, but of course much less so to the general reader. Most of them are so well shown in the cuts that the paper will be filed away by many who see it as one of permanent interest, while to the non-technical reader this rapid review of some 25 different remarkable feats of engineering, and of some of the most striking of modern processes, must be of great interest as well as most instructive.

TRADE CATALOGUES.

Price List and Illustrated Catalogue of Israel H. Johnson, Jr., & Co., Manufacturers of Metal Working Tools and Machinery. Philadelphia, Pa.

This is a handsome catalogue of 112 pages, illustrating and describing a variety of light and heavy tools, the product of this well-known house. It shows engine lathes from 13 to 54 in., and hand and speed lathes from 9 to 15 in., besides a number of special lathes and other special tools among which may be mentioned the car axle lathe, and the box-boring attachment, to use on a regular engine lathe, for boring car and locomotive boxes. The Wiegand gas compressing pump also is worth the attention of those who are fitting up for lighting cars by gas.

Contributions.

A Question of Transcontinental Traffic.

NEW YORK, June 7, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I would like to avail myself of the circulation of the *Gazette* among those most directly interested in the question involved—the presidents and managers of the railroads of this country—to offer a comment on the pamphlet by the Hon. Joseph Nimmo, Jr., lately Chief of the Government Bureau of Statistics, entitled "British Imperial Confederation," dealing with "the Political Railroads of Canada," and their present and probable future effect on the railroad traffic of the United States.

After reciting the well-known facts in regard to the Intercolonial, Grand Trunk, Canadian Pacific and the "Soo Lines," and pointing out that while the transit trade of the Canadian lines east of the Sault Ste. Marie benefits both countries, Mr. Nimmo calls attention to the fact that those west of that point divert the trade of the country from its natural course, not by offering any advantages as to time or distance, nor by any fair commercial competition, but simply by the force of a subsidy more than twice as large as the total of all the subsidies granted to *our* Pacific roads, which subsidy was granted for the sole purpose of carrying out political objects inimical to the interests of the United States. Mr. Nimmo says that "the Canadian Government has thrown the full force of a subsidy of about $130,000,000, expended upon the construction of the Canadian Pacific, and an annual subsidy of $300,000 to a British ocean steamer line, for the purpose of diverting an important branch of our foreign commerce from American to British transportation lines and trade centres, and that too, with the especial object in view of promoting imperial objects on this continent." And, further, that "it will not be possible to apply the requirements of a just system of internal regulations to our trans-continental railroad traffic so long as the Canadian Pacific Railway Company is left free to set such regulations at defiance." He concludes, quoting an English officer, that the effect of the fortifications at Esquimault, and the concentration of naval and military stores at that point, would be "to hold a pistol at the head of San Francisco," and "that Congress ought at once to respond to the attempt of the Canadian government to divert the Asiatic commerce of the United States by a discriminating duty of at least 40 per cent. on all imports from foreign countries by the way of the Canadian Pacific Railway, and to respond to the attempt to divert the internal commerce of the United States over short lines by a duty of at least 30 per cent. on all goods so transported;" and that these duties ought to be considered aside from any ordinary view of tariff policy.

It is not intended to question any of the facts presented by so careful a statistician as Mr. Nimmo, nor to doubt the conclusions he draws from them as to the danger with which they menace our transcontinental traffic or the trade and commerce of our country. But it may be doubted if restrictive duties of 40 and 30 per cent. against even a *too* grasping neighbor, is the best remedy to exhibit in this case. There will probably be a general acquiescence in Mr. Nimmo's statement that the present status east of the "Soo" is advantageous to both parties, and when the volume of trade diverted at the Soo becomes troublesome it is not impossible to bridge the Straits of Mackinac. This leaves the Asiatic and Japanese trade, in which the Canadians have already diverted about 42 per cent. of the tea shipped by the western coast. And here it seems better to fight subsidies by opposing and greater subsidies, than to restrict business. The freights from the region between Hong Kong and Yokohama are now gathered on ground contested between the steamers of the Peninsular & Oriental Co., which connect with lines touching at all Japanese ports and deliver freight at London via the Suez Canal, on the one hand, and on the other, the steamers of the Pacific Mail Co., which go to Hong Kong and have brought freights from as far east as Calcutta, and those of the Occidental & Oriental Co., those two working in harmony and delivering freight at San Francisco, and the Vancouver-Hong Kong lines. Or, in other words, there are now one line taking freight east and two lines taking it west. About a year ago the Peninsular & Oriental Co. concluded a 10 years' contract with the British government for a subsidy of £265,000 per annum, all of which, however, is not for the service to Japan. At that time the Chancellor of the Exchequer said, in consequence of some opposition from Canadian interests, "that would not in any degree interfere with the negotiation for subsidizing the route between Vancouver and Hong Kong;" and on the strength of this assertion Mr. Baden-Powell wrote to the London *Times*: "English steam lines will be established in the Pacific, and English trade thus obtain the command of that great arm of the world."

The Peninsular & Oriental, with a subsidy of nearly $13,000,000 for the ten years, would not see such an inroad on their traffic as would ensue from two competing lines taking freight, passengers, and the business which would follow the quickest mail route away from them without decreasing their charges; nor will the English give up their dream of supremacy in the Pacific, without, at least, a rate war that would greatly increase the volume of traffic, and probably lead to decreased cost in conducting it. For, aside from the traffic itself, the principal issue of a struggle of that kind would be whether London would continue to distribute the goods of the Indian archipelago, China or Japan, or they should be distributed at San Francisco and New York.

It is submitted that the proposed plan of restrictive duties would go far towards preventing an increase of traffic, any improvement in the method of conducting it, and all chance of advantage to any spot on this continent from the Asiatic trade; while it would injure Canada, in whose welfare, so it is not at our expense, we have a direct interest.

N.

TECHNICAL.

Locomotive Building.

At the annual meeting of the directors of the New York Locomotive Co. T. G. Nock was elected President, W. W. Wardwell Vice-President, A. M. Lawton Treasurer, and T. H. Stryker Secretary.

The Rogers Locomotive Works, of Paterson, N. J., have just completed an order for three locomotives for the Nashville, Chattanooga & St. Louis, and have also nearly completed three of an order for seven locomotives for the Long Island.

The Portland Locomotive Works, Portland, Me., are working on an order for two locomotives for the Quebec Central, and also one for the Windsor & Annapolis, of Nova Scotia.

The annual meeting of the Strong Locomotive Co. was held last week, and the old officers and board of directors were re-elected.

A contract was signed for the erection, within six months, of extensive works with special machinery for turning out the company's improved boilers. With these special tools the company believes it can turn out boilers as cheap per pound as the ordinary locomotive boiler can be constructed. It is expected that two of the new engines now building will be completed within 30 days.

The Taunton Locomotive Manufacturing Co. has just completed a locomotive for the Fitchburg.

Car Notes.

The New York Central & Hudson River is building six freight cars per day in its shops.

The Anniston Car Works of the United States Rolling Stock Co. have just completed 100 new ore dump cars for the Alabama Great Southern.

J. G. Brill & Co., Philadelphia, Pa., have completed five passenger cars for the Brooklyn, Bath & West End road. The road has also recently received a 35-ton locomotive.

Bridge Notes.

Bids are asked by E. B. Wood, Oysterville, Wash. T., for the building of a bridge, with approaches, across the Willapa River, at Oysterville. It is to be 225 ft. long.

The County Commissioners have decided to build several bridges in Lynn County, Iowa. Address J. E. Brumwell, County Auditor, Marion, Ia.

The New Jersey Steel & Iron Co., of Trenton, N. J., has received a contract for building a 225-ft. iron draw bridge over the Tombigbee River on the Western extension of the Georgia Pacific.

The county commissioners will build a bridge at Lakeside, N. Y.

Sealed proposals will be received until July 2 by City Engineer R. M. Clayton, of Atlanta, Ga., for the superstructure of an iron bridge over Grant street in that city.

It is reported that the selectmen will build an iron bridge at Chapin, Conn.

It is reported that a bridge will be built at Lovely Mount, Va.

Horace E. Horton, of Rochester, Minn., has been awarded the contract for building three iron bridges at Austin, Minn.

The following estimates for three bridges across the Mississippi, at streets in Minneapolis, have been submitted to the county commissioners by the engineers:

Length of bridge, Cedar, 5,540; Portland, 5,830; Lyndale, 5,615; cost of bridge, $46,964, $45,000, $45,398; cost of approaches, $52,627, $53,317, $53,490; total cost, $109,550, $108,150, $108,780.

The bridge proper in each case would consist of a draw-span of 229 ft. and one fixed span. The draw-span would give a clear water way of about 100 feet. No action was taken by the commissioners.

Manufacturing and Business.

A set of power conveyers, designed and built by the Industrial Works at Bay City, Mich., is being erected in the freight depot of the Grand Trunk at Port Huron, Mich., to facilitate the loading and unloading of the large quantities of flour in barrels and bags and other package freight which is transferred to and from the Lake Superior lines of boats running in connection with this road. These conveyers are in many respects similar to those which the company erected for the Buffalo freight yards of the New York Central & Hudson River, which have largely reduced the cost of handling freight, and added much to the capacity of the depots. Power conveyers built by the company are in use at Milwaukee and other points.

Among recent orders in other lines of the company's manufacturers, is one from the New York, Lake Erie & Western for a powerful wrecking crane and car, to be constructed entirely of iron and steel; also from the Chicago, Rock Island & Pacific for a turn-table, making the fourteenth which this system has purchased from them within a year past. Special attention is given by this concern to the building of various forms of freight handling machinery.

Iron and Steel.

It is stated that a company has been formed to build blast furnaces and rolling mills at Ontario, San Bernardino Co., Cal. It is also stated that a vein of ore suitable for Bessemer processes has been discovered near the proposed site of the works.

The furnace of the Clymer Iron Co., near Temple Station, Pa., will shortly be blown out. After the blowing out of the Macungie furnace, at Macungie, in a few weeks from now, the entire hot blast will be torn away, and a new and much larger one erected in its place.

The Warren Iron Co. has lately blown in the Warren furnace at Hackettstown, N. J.

The Vulcan Iron Works, Chicago, have contracted for the swinging machinery for the Wells street bridge from the United States Construction Co., as well as for the iron work for several other bridges.

The Lickdale Iron Co., of Lebanon, Pa., has just started its works making steel by the Clapp-Griffith process. Their capacity is about 1,000 tons per week.

The addition being built to the works of the Falcon Foundry & Machine Works, which is owned by the Lloyd Booth Co., of Youngstown, O., is expected to be completed in 30 days. The building is 42 × 90 ft., with a wing 15 × 60. In addition there will be placed a 14-ton traveling crane. A 20-ton air furnace, with a daily capacity of 40 tons, will be placed in the foundry, as well as other improvements.

The Knoxville Iron Co., of Knoxville, Tenn., have contracted with Laughlin & Co., engineers and contractors, Cleveland, O., for the erection of two regenerative gas heating furnaces.

The Scovel & Irwin Construction Co. has been organized, with the principal office at Birmingham, Ala., succeeding the firm of Scovel & Irwin, construction and general supplies, of Nashville. The company is chartered to build and equip city, suburban and steam railroads, water-works, gas plants, blast furnaces, rolling mills, etc. Major Scovel is President; H. S. Jackson, Vice-President, and A. M. Irwin, Secretary and Treasurer.

The Troy Steel & Iron Co., Troy, N. Y., is using oil under the Heine boilers at the new blast-furnace plant, and are experimenting with the same fuel for puddling.

The plant of the Carbon Co., Pittsburgh, Pa., is to be turned into a modern steel-works. The erection of two Lash steel melting furnaces has already been commenced.

At the annual meeting of the Union Steel Co., of Chicago, Jay C. Morse was chosen President, and H. A. Gray, Secretary and Treasurer.

The Swindell Construction Co. has closed the following contracts: Three large regenerative gas furnaces of the Siemens type, including gas sewers, for Messrs. Henry Disston & Sons, Philadelphia. The gas for these furnaces will be furnished by an improved gas plant, constructed by the Loomis Gas Machinery Co. One 15-ton open hearth furnace, including gas producers, all complete, for the Lobdell Car Wheel Co., Wilmington, Del. This furnace will be used for the melting of pig iron for foundry purposes, thus taking the place of a cupola, and is the first gas furnace in the country for this purpose. The Swindell Co. have also just completed a 16 ft. × 16 ft. Siemens gas furnace for the Phœnix Iron Co., Phœnixville, Pa., and are at present building for the same firm two large gas furnaces for their blooming mill, and also the foundation for said mill, which requires about a million brick. They also have a contract with the Columbia Iron & Steel Co., Uniontown, Pa., for a large gas furnace for heating cold ingots, and have just completed a large annealing furnace for the Mosler Bank Safe Co., Cincinnati, O.—*American Manufacturer.*

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston, Revere Beach & Lynn, 3½ per cent., payable July 2, to stockholders of record June 20.

Brooklyn & Montauk, 30 per cent. on preferred stock, and 20 per cent. on common stock, payable July 2, to stockholders of record June 21.

Cheshire, 3 per cent. on preferred stock, payable July 10, to stockholders of record June 21.

Chicago, St. Paul, Minneapolis & Omaha, 3 per cent. on preferred stock, payable July 20, to stockholders of record June 30.

Flint & Pere Marquette (extra), 5 per cent. on preferred stock, payable July 10.

Lehigh Valley, quarterly, 1¼ per cent., payable July 16, to stockholders of record June 12.

Missouri Pacific, quarterly, 1 per cent., payable July 16, to stockholders of record June 29.

Northern Central, semi-annual, 3 per cent., payable July 16.

Oregon Railway & Navigation Co., quarterly, 1½ per cent., payable July 2, to stockholders of record June 21.

Richmond & Danville, semi-annual, 5 per cent., payable July 2, to stockholders of record June 25.

Richmond, Fredericksburg & Potomac, 3½ per cent., payable July, 1 to stockholders of record June 21.

Richmond & West Point Terminal Railway & Warehouse Co., semi-annual, 2½ per cent. on preferred stock, payable July 2, to stockholders of record June 25.

St. Paul & Duluth, semi-annual, 3½ per cent. on preferred stock, payable July 10, to stockholders of record June 30.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Toledo & Ohio Central, special meeting, Toledo, O., July 14.

Wilkesbarre & Scranton, special meeting, Philadelphia, Pa., July 2.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Civil Engineers will hold its annual convention in Milwaukee, Wis., beginning June 28.

The *Ohio Institute of Mining Engineers* will hold its summer meeting at Logan, O., commencing July 11.

The *International Association of Car Accountants* will hold its annual meeting in Montreal, Can., June 20.

The Railroad Accounting Officers will meet at the Hotel Brunswick, New York City, July 25, to organize a permanent association.

The Association of Railway Telegraph Superintendents will hold its seventh annual meeting at the Murray Hill Hotel in New York city July 11.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The *National Association of General Baggage Agents* will hold its next meeting in New York City July 18.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* meets in Chicago the third Wednesday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

The *Roadmasters' Association of America* will hold its next convention at Washington, D. C., Sept. 11.

The *New England Roadmasters' Association* will hold its sixth annual convention at Boston, Mass., Aug. 15–16.

Engineers' Club of Kansas City.

A regular meeting was held June 4. The paper of the evening was read by Mr. Breithaupt, on the crossing of the Chicago, Santa Fe & California over the tracks of the Missouri Pacific and the Chicago & Alton, near the Rock Creek Station. The crossing is by a riveted pony truss bridge, on a skew, and considerable ingenuity had to be exercised in keeping clear of the tracks during the construction. The discussion was chiefly with reference to the number and spacing of stringers for economy, and the effect of extreme rigidity in bridge structures.

Mr. Pearsons was appointed a committee of one to collect nd forward subscriptions in aid of the family of the late W. aR. Kutter.

The following members were elected: Albert N. Connett, Bolton W. De Courcy. Victor M. Whitmer was elected an associate member.

Convention of Train Dispatchers.

The fifth annual meeting of the American Train Dispatchers' Association was held in Louisville, Ky., last week, commencing June 12. Fifty-one members were in attendance.

It was decided to form a new association, and A. A. Zion (Indianapolis Union) was chosen temporary chairman. After appoiting committees on organization and constitution, the convention adjourned, reassembling Wednesday morning.

The committee on constitution recommended that the organization be called "The Train Dispatchers' Association of America." To the mutual benefit feature, any train dispatcher in America between 21 and 55 years of age may become a a member after passing medical examination. The constitution also provides that members of the old association may become charter members without paying an initiation fee. It was adopted as reported, with some slight changes.

At the afternoon session Mr. W. M. Eggleston (J., M. & I.), was elected chairman of the committee on mutual benefit association.

The following committee was appointed to prepare a list of topics for the next meeting and to appoint members to prepare papers to be read, etc.: H. O. Pond (Col. & East.); W. B. Blanton (C St. P. & K. C.); C. A. Batterton (C. & N. W.); J. D. Dowd (D. & H. C. Co.), and W. H. Stevens.

W. H. Graves, J. W. Pelot and W. P. Sutherland were appointed a committee on resolutions.

The following officers were elected: A. A. Zion, Indianapolis, President; E. A. Smith, Fitchburg Railroad, Vice-President; E. J. Peabody, Chicago, Secretary and Treasurer.

After deciding to hold the next annual meeting in Indianapolis, Ind., the convention adjourned June 13.

PERSONAL.

—H. B. La Rue, who for the past eleven years has represented the Midvale Steel Co., severs his connection therewith on Aug. 15.

—Mr. Henry D. Hall, Secretary and Treasurer of the Consolidated Railway Telegraph & Telephone Co. since its organization, has resigned, and will spend the summer in Colorado. His resignation was received by the directors with earnest and complimentary expressions of regret.

—Mr. H. J. Small, for the last year Assistant Superintendent of Motive Power, Philadelphia & Reading, has resigned to accept a leading position on a California road. Mr. Small was previously and for six years the Assistant Superintendent of Motive Power on the Northern Pacific, and has had extended experience.

—E. B. Taylor, Manager of the Pennsylvania Co., and late Superintendent of the Pittsburgh, Cincinnati & St. Louis, was presented last week with a magnificent gold watch, chain, charm and a diamond ring and pin by employés, shippers and residents along the Panhandle road. Mr. Taylor was taken entirely by surprise, but responded in a very happy manner.

—John Francis, who succeeds P. S. Eustis as General Passenger and Ticket Agent of the Burlington & Missouri River, is 34 years old and a Canadian by birth. In 1872 he was appointed station operator and clerk on the Grand Trunk, and in 1880 he became Traveling Passenger Agent of the Flint & Pere Marquette. He became connected with the Burlington & Missouri River in April, 1881.

—First Vice-President Edmund Smith, of the Pennsylvania, has resigned, to take effect June 30. He entered the engineer corps of the company in 1847, and was engaged for several years in the building of the road, both on the eastern and western divisions. He was elected Secretary in 1855, filling that position until 1869, when he was made Third Vice-President. In 1873 he was Treasurer, and in 1874 resumed his position as Vice-President. He has for a long time had immediate charge of the financial and accounting departments of the company. In 1886, when the company was for nearly a year without a Treasurer or Assistant Treasurer, owing to the illness of those officers, he discharged the duties of both positions in addition to those of Vice-President. After his long service, Mr. Smith retires to obtain some rest, although in the prime of life and in the enjoyment of vigorous health.

At a meeting of the directors of the Pennsylvania, a minute was adopted, stating that in accepting with deep regret the resignation of Mr. Smith, they desired to "place upon their minutes a warm expression of their high esteem and their recognition of his faithful service to this company and his devotion to its interests in the many responsible positions held by him during a term of service of over 41 years. In the severance of the ties which have bound the members of this board through so many years of kindly intercourse, Mr. Smith will bear with him the heartfelt wishes of his associates for many years of health and happiness as an honored citizen of the commonwealth in which he has spent so great a portion of his useful and busy life."

ELECTIONS AND APPOINTMENTS.

Atlantic & Pacific.—The following officers were elected at a meeting of the directors held June 15: President, H. C. Nutt; First Vice-President, E. F. Winslow; Second Vice-President, W. B. Strong; Secretary and Treasurer, H. W. Gardner; Auditor, F. B. Hancock; General Manager, Western Division, C. W. Smith; Central Division, H. L. Morrill; Executive Committee, W. B. Strong, E. F. Winslow, H. C. Nutt, J. Seligman and B. P. Cheney.

Baltimore & Ohio.—A. P. Gorman, J. McKenney White, J. Hodges and H. W. Talbott have been elected State Directors in the company.

W. H. Blackford has been chosen a director in place of T. H. Garrett, deceased.

Burlington & Missouri River.—John Francis has been appointed General Passenger and Ticket Agent, to succeed P. S. Eustis, promoted.

Cincinnati, Hamilton & Dayton.—The following directors were chosen at the annual election in Cincinnati June 19: Julius Dexter, Sidney Dillon, Mahlon C. Martin, William A. Proctor, James Rawson, Jr., Russell Sage, Henry D. A. Taylor, C. C. Waite, and Eugene Zimmer. They received more than two-thirds of the shares voted, and represent the present management of the road. The 6,400 shares, of which H. S. Ives & Co. claimed the ownership were disfranchised by the courts.

Elkhart & Western.—The following officers were elected at a meeting in Elkhart, Ind., June 12: Herbert E. Bucklen, of Chicago, President; F. R. Beardsley, Elkhart, Vice-President; C. H. Winchester, Elkhart, Treasurer; D. Maxon, Elkhart, Auditor; and E. C. Bickel, Elkhart, Secretary and General Manager.

Falls Church & Potomac.—The following officers have been elected: R. Morrison, President; N. F. Graham, Vice-President; S. Duryea, Secretary, and E. A. Greenough, Treasurer. The general office is in Alexandria, La.

Fremont, Elkhorn & Missouri Valley.—The following officers were elected at the annual meeting last week: Marvin Hughitt, President; Albert Keep, Vice-President; M. M. Kirkman, Treasurer; J. B. Redfield, Secretary; John B. Hawley, Assistant Secretary; J. E. Ainsworth, Chief Engineer. Executive Committee: Marvin Hughitt, Albert Keep, J. B. Redfield.

Kentucky Union.—John M. Atherton has been elected a director.

Michigan Central.—John Burns has been appointed Roadmaster, with headquarters at West Bay City, Mich.

Milwaukee, Lake Shore & Western.—The annual meeting was held at Milwaukee, Wis., last week, at which the following directors were elected for three years: F. W. Rhinelander, W. K. Hinman, D. Parrish and William Henry Reese, of New York. The latter succeeds C. G. Ramsey, of Norfolk, Va.

Minneapolis, St. Paul & Sault Ste. Marie.—The directors of the consolidated company are: J. S. Pillsbury, Thomas Lowry, R. B. Langdon, H. E. Fletcher, C. F. Pettit, C. G. Merriam, J. C. Oswald, C. J. Martin, W. H. Eustis, M. B. Coon, and J. M. Shaw.

Monterey & Tampico.—C. S. Masten, of Phœnix, Ariz., is the Chief Engineer and General Manager of this Mexican road.

New York, Lake Erie & Western.—William Humphrey has been appointed Roadmaster of the Northern of New Jersey and Greenwood Lake division.

Northern Pacific Terminal Company.—At the annual meeting the following directors were elected: Robert Harris, Elijah Smith, Henry Villard, R. Koehler, C. A. Dolph, Henry Failing, Paul Scnulz, W. H. Holcomb, and C. H. Lewis.

Oregon Railway & Navigation Co.—The annual election was held in Portland, Or., June 19. The following directors were elected: Elijah Smith, John H. Hall, Sidney Dillon, Christopher Meyer, Charles L. Colby, Colgate Hoyt, Henry Failing, H. W. Corbett, C. H. Lewis, C. A. Dolph, W. H. Holcomb, W. S. Ladd and S. B. Wiley.

Oregon & Transcontinental Company.—The following directors were elected at the annual meeting in Portland, June 19: W. L. Bull, Charles L. Colby, Sidney Dillon, Colgate Hoyt, Brayton Ives, G. M. Lane, C. A. Sheppard, Henry Villard, C. B. Bellinger, C. A. Dolph, J. M. Fox, L. L. Hawkins, Frederick V. Holman, William McIntosh, C. H. Prescott, Paul Schulz, and Joseph Simon. The directors elected officers as follows: President, Henry Villard; Vice-President, Brayton Ives; Second Vice-President, C. B. Bellinger; Secretary, S. B. Wiley; Treasurer and Assistant Secretary, Edward Eads.

Pawnee.—The incorporators of this new Illinois company are Charles Kerr, John F. Armstrong, John H. Underwood and Columbus White, of Springfield, and Jacob M. White and C. E. Clayton, of Pawnee.

Pleasure Beach & Los Angeles Belt.—The directors of this new California road are: Alva Udell, of San Francisco; T. L. McCarthy, of Dixon; J. B. Ralston, of San Francisco; Geo. Cooper, of Dixon; J. W. Greene, of Sacramento.

Portland, Saco & Portsmouth.—The directors elected the following officers at a meeting in Boston May 14: President, S. C. Lawrence, of Medford, Mass.; Treasurer, Edward Lesley, of Boston; Secretary, F. R. Barrett, of Portland.

Portsmouth, Great Falls & Conway.—The following officers were elected at a meeting in Boston last week: President, S. C. Lawrence, of Medford; Treasurer, Edward Lesley, of Boston; Secretary, Wallace Hackett, of Portsmouth.

Rochester & Genesee Valley.—The following directors have been chosen; James Brackett, J. B. Perkins, J. E. Butterfield, W. N. Coggswell, Charles F. Pond, L. Clinton Gray.

Rome & Carthage—The following directors of this new road were elected at a meeting in Rome, N. Y., June 13: G. V. Selden, J. C. Smith, M. C. West, A. W. Orton, O. E. Owens, W. W. Wardwell, John R. Edwards, of Rome; M. P. Mason, of Carthage; C. A. Chickering, A. L. Clark, of Copenhagen; Chester Ray, of Martinsburg; H. G. Emm, of Turin; S. T. Miller, of Constableville. The directors elected the following officers: G. V. Selden, of Rome, President; Chester Ray, of Martinsburg, Vice-President; A. W. Orton, Rome, Secretary and Treasurer.

St. Louis, Alton & Springfield.—F. E. Fisher has been appointed General Freight Agent, with headquarters at Springfield, Ill.

St. Louis & San Francisco.—Directors have elected the following officers: President, E. F. Winslow; Vice-President, John O'Day; Second Vice-President and General Manager, H. L. Morrill; Secretary and Treasurer, T. W. Lillie; Assistant Secretary and Assistant Treasurer, George Butler; Auditor, Alexander Douglas.

Salt Lake & Los Angeles.—The following are named as directors in the charter filed in California: Isaac Trumbo, Alexander Badlam, W. H. Brown, George Burgess and John W. Creagh.

Statesville Air Line.—The following officers have been elected: President, J. J. Mott; Chief Engineer, W. N. Eliason; Secretary and Treasurer, C. A. Carlton, all of Statesville, N. C.

Texas & Pacific.—G. McD. Nathan has been appointed Contracting Agent, with headquarters in New York.

Toledo, Peoria & Western.—James M. Warner has been appointed General Trainmaster, with office in Peoria, Ill

Valley (Ohio).—John Newell, President of the Lake Shore, has been elected a director.

OLD AND NEW ROADS.

New Companies Organized.—Birmingham & Vernon Mineral.—Minneapolis, St. Paul & Sault Ste. Marie.—Pawnee.—Pleasure Beach & Los Angeles Beach.

Atlanta & Florida.—The road has now been completed south to Knoxville, Crawford County, Ga., 87 miles from Atlanta, and placed in operation.

Atlantic & Danville.—Grading will soon begin, it is reported, on the extension from Belfield to Danville, Va., for which the surveys are now being made.

Baltimore & Ohio.—The monthly meeting of the board of directors in Baltimore, June 20, ratified the sale of the company's sleeping car equipment and the franchises pertaining thereto to the Pullman Palace Car Company. The Pullman Company contracts to do the sleeping and parlor car business of the road for 25 years. The sale includes 85 cars, and it is said that the price paid is $1,250,000.

Birmingham Mineral.—The first train on the Gate City extension was run last week. The extension is being rapidly pushed to Trussville, Ala.

Birmingham & Vernon Mineral.—Incorporated in Alabama to construct a road 12 miles in length, from Vernon, Lamar County, northerly to a connection with the Kansas City, Memphis & Birmingham.

California Central.—All the bridging has been completed on the new line between Los Angeles and San Diego, and track is being laid by four gangs between Los Angeles and Orange, 32 miles, and San Juan and Oceanside, 24 miles. It is thought the entire line will be ready for operation by August 1.

Charleston, Cincinnati & Chicago.—It is expected that the tracklaying will be completed to Rockville by July 12 and to Blacks, S. C., by Sept. 1. The grading to Blacks, which is 61 miles from the present end of the track at the Catawba River, has all been completed and the rails for the track purchased. From Blacks to Rutherfordton, 45 miles, the road is in operation, and the continuous line of 290 miles from Charleston to Rutherfordton will be opened early in September. The piers for the bridge over the river have been completed, the first two spans erected, and the bridge will probably be entirely completed by July 1. It is a Howe truss, of four spans, of 125 ft. each.

The locating survey from Rutherfordton through Marion, N. C., and Johnson City, Tenn., toward Ashland, Ky., on the Ohio River, is nearing completion, and the contracts for this division of the road will probably be let early in the fall.

Chattanooga, Rome & Columbus.—Tracklaying on this road is almost completed, and it is believed that the line will be in operation from Chattanooga, Tenn., to Carrolton, Ga., soon after July 1. It is stated that work will then be immediately commenced from Carrolton south to Columbus.

Cincinnati & Richmond.—The road was opened for traffic June 17, it being found necessary to postpone the date from June 11, as first announced. It extends from Red Bank to Hamilton, O., and will be operated for the present as a branch of the Little Miami division of the Pittsburgh, Cincinnati & St. Louis. The Adams express operates over the road.

Columbus & Western.—Coosa Mountain Tunnel, on the extension from Goodwater to Birmingham, Ala., was completed at 10 o'clock on the morning of June 17. The approaches, timbering, etc., have now all been finished, and the track will be laid through the tunnel this week. The tunnel is 2,445 ft. long, 16 ft. wide, clear of the posts, and 21 ft. high. The first rock was removed Feb. 23, 1887, and the headings met on Feb. 23, 1888. The tunnel, as was also the Oak Mountain tunnel, on the same extension, was built by Dunavant, Tate & De Bardeleben, contractors, of Memphis, Tenn. J. A. Baker has been Resident Engineer superintending the work, and F. G. Dabney, Chief Engineer.

Eau Claire, Mississippi & Lake Superior.—The preliminary survey for this road, recently incorporated in Minnesota, has been commenced, and about 20 miles of the line have been surveyed southerly from Eau Claire toward Independence and Winona, Minn. C. E. Bassell is Chief Engineer.

Elkhart & Western.—It is stated that the promoters of this enterprise have decided to make their terminus at South Bend, Ind., about 5 miles west of Mishawaka, which was first announced as the objective point.

The company has made arrangements for commencing the surveys immediately, and the contracts will be let when they have been completed and the right of way secured. E. C. Bickel, Elkhart, Ind., is General Manager.

Fort Worth & Rio Grande.—At a meeting of the stockholders, held at Fort Worth, Tex., the increase of the capital stock of the company to $3,000,000 was authorized.

Grand Southern.—This New Brunswick road was sold under foreclosure this week to Russell Sage and Giles E. Taintor, for the bondholders, for $101,000.

Ilwaco & Shoalwater Bay.—Much of the grading on the road from Ilwaco, Wash. T., north four miles to North Beach, has been completed, and tracklaying was commenced last week. It is thought the road will be ready for operation by July 1.

Kansas City, Arkansas & New Orleans.—The locating survey of the main line of the road was completed this week, and it is expected that the survey for the branch between Pine Bluff and Monticello, Ark., will be finished early in July.

Kinzua Creek & Kane.—Chartered in Pennsylvania with a capital stock of $120,000 to build a 12-mile road in McKean County.

Los Angeles County.—Over ten miles of tracklaying has been completed on this road, which is being built from Los Angeles to Santa Monica, Cal., 18 miles.

Manchester & Portland.—The Manchester (Conn.) Business Men's Association has passed a resolution ordering that a survey of the proposed road be made at once from Rockville to Portland, Conn.

Manitoba.—It is stated that the Provincial Government is negotiating with the Northern Pacific and Manitoba & Northwestern for the building of a road from Winnipeg to Portage la Prairie.

Memphis, Oxford & Columbus.—The survey for the road was commenced this week at Memphis and will be completed as soon as possible to Columbus, Miss. J. M. Abbott, West Point, Miss., is President.

Mexico.—A concession of $8,000 per kilometre and a guarantee of 6 per cent. interest on bonds has been granted by the government for the building of a road from Tonala to Tuxtle, in the state of Chiapas. The road may also be extended to San Christobal in the same state.

Midland (Indiana).—A locating survey for the extension of the line from Waveland, Ind., westerly to a connection with the Indianapolis, Decatur & Springfield is being made.

Minneapolis, St. Paul & Sault Ste. Marie.—Articles consolidating the Minneapolis, Sault Ste. Marie & Atlantic, Minneapolis & Pacific and Aberdeen, Bismarck & Northwestern, under the above name, were filed in Minnesota last week. The capital stock is $21,000,000.

Montana Central.—Track-laying on the 73 mile extension from Helena to Butte, Mont., has been completed through Boulder Valley, 35 miles, and is progressing rapidly toward Butte, which it is expected to reach about the middle of July.

Napanee, Tamworth & Quebec.—The location has been completed for the extension from the present northern terminus at Tamworth, northwesterly to Tweed, on the Canadian Pacific, about 20 miles, and the plans and profiles filed with the Department of Railways. Work will begin immediately and about 10 miles constructed this season. M. J. Butler, Frasersville, Quebec, is chief engineer.

Nashville, Florence & Sheffield.—Tracklaying on this branch of the Louisville & Nashville was completed June 16. It extends from St. Joseph, Tenn., southerly to Sheffield and Florence, Ala., connecting at the latter place with the Memphis & Charleston. The West Point branch has been completed to Ironton, Tenn.

New York, Providence & Boston.—The double-tracking of the road has been completed from Mystic, Conn., to beyond Noank.

Norfolk & Virginia Beach.—It is stated that the company contemplates building a branch to Princess Anne C. H., Va., at a cost of nearly $200,000. T. O. Troy, Norfolk, Va., is Superintendent.

Northern Central.—The directors last week declared a semi-annual dividend of three per cent., payable July 16. Last year the annual dividend was at the rate of eight per cent. in cash; and there was also a stock dividend of 10 per cent. The net earnings for the last five years have never been less than 12 per cent. of the capital stock. In one year they amounted to over 16 per cent., and in another to almost that amount.

Northern New Jersey.—The double track from Jersey City to Cresskill, N. J., 18 miles, has been completed.

Northwestern Coal & Navigation Co.—It is reported that the company has under consideration the building of a railroad from a point near Lethbridge, Alberta, N. W. T., to a connection with one of the roads of this country at the international boundary. The object is to provide a line for the transportation of coal to Montana mines.

Ohio & Northwestern.—The bondholders have applied to the Court of the Southern District of Ohio, for a receiver, and Samuel Hunt, who has been general superintendent, has been appointed. The road extends from Portsmouth, westerly, 102 miles to Batavia Junction, near Cincinnati, which city it enters over the tracks of the Little Miami. There are also several short branches. It is rumored that the Pennsylvania is seeking control of the road.

Oregon & California.—The order for the discharge of the Receiver has been granted, but it will probably be a month yet before the accounts are settled and control of the road transferred to the company. The road will then be operated by the Southern Pacific under a 40 years' lease.

Ohio Valley.—At a meeting of the directors in New York City this week it was decided to extend the road north to Evansville, Ind., from the present northern terminus at Henderson, Ky. It is also proposed to extend the road south from the terminus at Princeton, Ky. It is stated that new bonds will be issued to pay for the construction of the extensions.

Pawnee.—Articles of incorporation have been filed in Illinois to build a road from Taylorville, Christian Co., northeasterly about 25 miles, to a point on the St. Louis & Chicago between Glenarm and Divernon, in Sangamon County. The capital stock is $50,000, and the principal office is to be at Pawnee.

Pennsylvania, Poughkeepsie & Boston.—At a meeting of the stockholders, in New York, this week, the directors were given power to issue a mortgage at the rate of $30,000 per mile of single track road, and at the rate of $40,000 per mile of double track, though it is not expected to issue it at a greater rate than $25,000 per mile. A large force is engaged in grading the road from the Poughkeepsie Bridge to Montgomery, N. Y., a distance of 22 miles. Work was also commenced last week with a small force on that part of the road between Poughkeepsie and Silvernail Bridge, where connection is to be made with the Hartford & Connecticut Western, which is controlled by this company.

Pittsburgh, Shenango & Lake Erie.—Articles consolidating the road with the Erie, Shenango & Pittsburgh and the Northeastern Ohio have been filed in Pennsylvania and Ohio. The extension from Greenville to a connection at Amasa, Pa., with the Lake Shore & Michigan Southern was built under the charter of the former road, and the Northeastern Ohio was formed to build the extension to Lake Erie. It has not been decided when work will be commenced, nor has the terminal on Lake Erie been definitely determined. It is stated that the extension may be built to both Erie and Conneaut, Pa.

Pleasure Beach & Los Angeles Belt.—Chartered in California to build a road in Los Angeles County from Rancho San Pedro through Rancho Boca de Santa Monica to the city of Los Angeles, an estimated distance of 60 miles. The capital stock is placed at $1,500,000, and the principal office is to be in Sacramento.

Pomona & Elsinore.—The Pacific Improvement Co. has contracted for the tracklaying on the road between Pomona and South Riverside, Cal., the work to be completed within six weeks. The Pacific Improvement Co. will also furnish the rolling stock for the road before January 1, 1889. This is understood to mean that the Southern Pacific will operate the road.

St. Louis, Kansas City & Colorado.—The directors have decided to issue a deed of trust to the Chicago, Kansas & Western (A., T. & S. F.) to the amount of $25,000 per mile, the proceeds to be applied to the payment of the existing lien and the construction of the road. Construction will be commenced in a few days.

St. Louis & San Francisco.—The company will issue $7,144,000 five per cent. general mortgage bonds to retire an equal amount of six per cent. bonds of the South Pacific. These latter bonds are a first lien on the South Pacific road between Pacific and Seneca, Mo., 293 miles, and the land grant, and are due July 1, 1888. The new issue will save an annual interest charge of $71,445, and was placed early in the year by J. & W. Seligman & Co., of New York.

St. Paul, Black Hills & Dakota.—General Manager L. G. Johnson, is reported as saying that a survey would at once be made, starting from Mandan, opposite Bismarck, continuing from thence southwesterly to the Black Hills.

Salt Lake & Los Angeles.—The company has filed articles of incorporation in California to build a road from Los Angeles in a general northwesterly direction through the counties of Los Angeles, Kern, Tulare, Inyo and Mono to the state line, thence to Salt Lake City. The capital stock is placed at $20,000,000.

San Antonio & Aransas Pass.—Tracklaying on the branch from Skidmore to Kleburg, Tex., on the Mexican National, has been completed, and the line will probably soon be opened for business. It is stated that tracklaying on the 12-mile branch north to Rockport, on Aransas Bay, will be commenced immediately.

Santa Ana, Fairview & Pacific.—Tracklaying on this short California road has been completed, and it will shortly be opened for business. It extends from Santa Ana to Fairview, a distance of 8 miles.

Southern Pacific.—Track is laid beyond Orange on the branch from Anaheim to Tustin, and it is expected to reach the latter place next week. The bridges over Santa Ana River and Santiaga Creek are nearing completion.

South Pennsylvania.—The hearing in the two suits of the Pennsylvania, which have been pending in New York for over a year, against the stockholders of the Beech Creek & South Pennsylvania, was begun in Philadelphia June 15. The evidence submitted by Judge Logan was mainly of a documentary nature. The defendants are J. Pierpont Morgan and others, executors of William H. Vanderbilt, James B. Colgate & Co., W. T. Hatch & Sons, Abram S. Hewitt, J. D. and William Rockefeller, O. H. Payne, William C. Whitney, and other stockholders of the South Pennsylvania, and the defense attempted to show that, through various traffic contracts, the projected South Pennsylvania has a system extending from Chicago to New York and Philadelphia, and would be a competitor with the Pennsylvania, and that through a traffic contract with the Philadelphia & Reading it would compete for the Pittsburgh business. Further hearing was postponed to June 22, in New York.

Staten Island Rapid Transit.—The double track between New Dorp and Clifton, Staten Island, has been completed, and a two-mile extension has been built from Clifton to a point beyond Fort Wadsworth.

Tampa & Thonotosassa.—Incorporated in Florida to build a road from Tampa to Thonotosassa, about 15 miles. The capital stock is $50,000. L. Bailey is President.

Tennessee & Coosa.—Work was commenced at Huntsville, Ala., last week by the sub-contractors on the extension of the road from Gadsden to Huntsville.

Utah Central.—The directors have resolved to extend the road from its present terminus westerly about 85 miles to near the Nevada line. It is stated that construction will not begin till next Spring.

Waco & Brazos Valley.—It is stated that the deed of sale, transferring control of the road to the San Antonio & Aransas Pass, has been signed by officers of both roads, control not being assumed, however, until the grading between Waco and Cameron, Tex., has been completed. The track is then to be laid from Waco by the San Antonio & Aransas Pass. This work will be commenced early in July. The road had secured right of way through Waco, and depot grounds, but the St. Louis, Arkansas & Texas has laid a side track, under a previous permit, over the route of the Waco & Brazos Valley, preventing the latter road from reaching its depot grounds.

Wilmington Sea Coast.—The road was formally opened June 16, nearly 1,000 people attending the ceremonies. The silver spike was driven by the President of the company. The road extends from Wilmington, N. C., about 9½ miles, to the ocean beach at Wrightsville.

Winona & Southwestern.—The contract for grading that part of the road from Winona to Mason City, Ia., a distance of about 130 miles, has been let to Langdon & Co., of Minneapolis, Minn.

Wisconsin Central.—Amended articles of incorporation have been filed in Wisconsin, providing for several branches and extensions of the road. The longest is from Marshfield in a general westerly direction through Wood, Clark and Eau Claire counties to a point in Chippewa County, a distance of about 65 miles. Another branch will run from Marshfield, directly west about 13 miles to Fremont, in Clark County.

TRAFFIC AND EARNINGS.

The Inter-state Commerce Commission.

The hearing on the complaint of the New York Produce Exchange, of which a partial report was printed last week, was concluded on June 14. John S. Wilson, General Freight Traffic Agent of the Pennsylvania, testified concerning the practice of that road in export business. The road has no present arrangement with any steamship company. From November until February last it had arrangents with certain lines whereby the vessels received half the through rate from Chicago to Liverpool. When tramp steamers were taking grain as low as 3 cents the Pennsylvania had allowed the ocean lines 15 cents "for the purpose of steadying rates." The attorney for the Exchange intimated that the Pennsylvania Railroad had bought grain in the market through the firm of Peter Wright & Sons in order to afford traffic for its steamer line. This was denied by the counsel for the road. Mr. Wilson was satisfied that grain is now going from Chicago to Liverpool via Boston at less than the Boston export rate. Mr. MacVeagh, counsel for the road, in his closing argument laid stress on the fact that the Pennsylvania, unlike the roads delivering exclusively at New York, transferred grain from cars to ship without the aid of lighters. The counsel were given three weeks in which to file their briefs.

Traffic Notes.

The complaint entered before the Interstate Commerce Commission by the Chicago dressed beef shippers, some months ago, charging discrimination in rates to the east, has been withdrawn and dismissed without prejudice. It is understood that the shippers and the railroads have come to an agreement, the terms of which are not made public. It is surmised that the rate will be uniform to New York and Boston—probably 50 cents.

The Cincinnati, Indianapolis, St. Louis & Chicago and the

Cincinnati, Hamilton & Dayton have given notice of their withdrawal from the passenger department of the Ohio River Division of the Central Traffic Association.

The Chicago Lumber Association, composed of leading lumber firms of that city, has sent to the railroads a formal protest declaring that the present custom of making through rates from Wisconsin, Minnesota and Michigan points to Illinois, Indiana, Ohio and points southwest, south and east of Chicago, which are less than the combined local rates to and from Chicago, is disastrous to the Chicago trade.

The complaint of the Milwaukee Chamber of Commerce against the Chicago, Milwaukee & St Paul and the Chicago & Northwestern, which was entered before the Wisconsin State Railroad Commissioner several weeks ago, charging discrimination against the City of Milwaukee in the arrangements and customs connected with grain shipping, has been dismissed, the Commissioner deciding that the railroads are not guilty of the acts alleged.

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending June 9 and the year to that date was as follows:

	Coal.	Coke.	Total.
Total for week ending June 9..	227,332	76,706	304,038
Total for year 1888 to date.....	5,131,051	1,728,785	6,859,836
Total for year 1887 to date.....	4,625,946	1,564,380	6,190,326

The anthracite coal tonnage of the Belvidere Division of the United Railroads of New Jersey Division for the same periods was as follows:

	1888.	1887.	Inc. or Dec.	
Total for week ending June 9.	31,776	30,458	I.	1,318
Total for year to June 9.	681,097	783,702	D.	102,605

The cotton movement for the week ending June 15 is reported as follows, in bales:

Interior markets:	1888.	1887.	Increase.	P. c.
Receipts.....	6,925	2,421	4,504	200.0
Shipments.....	16,795	7,987	8,808	114.0
Stock.....	83,079	46,093	36,986	78.2
Seaports:				
Receipts.....	16,812	3,549	13 263	433.3
Exports.....	38,001	8.528	29,473	362.5
Stock.....	332,806	315,016	17,790	5.4

The coal tonnages for the week ending June 16 are reported as follows:

	1888.	1887.	Inc. or Dec.		P. c.
Anthracite	702 589	684,041	I.	18,548	2.6
Bituminous.....	293,360	301,637	D.	18,268	6.0

The Cumberland coal trade for the week ending June 16 amounted to 77,625 tons, and for the year to that date 1,586,365 tons.

Anthracite Coal Tonnage.

The statement of the anthracite coal tonnage for the month of May, as compared with the same period last year, is as follows:

	May. 1888.	May. 1887.	Inc. or Dec.	
Phila. & Reading	568,117	547,507	I.	20,610
Lehigh Valley.	583,580	541,061	I.	42,518
Central of N. J.....	444,220	396,156	I.	48,064
Del., Lack. & West.	393,123	441,687	D.	48,564
Del. & Hud. Canal Co...	264,953	266,402	D.	1,449
Pennsylvania	391,873	313.512	I.	78,361
Pennsylvania Coal Co....	122,888	127.159	D.	4,271
N. Y., L. E. & W.. ...	82,716	66,869	I.	15,847
Total....	2,851,470	2,700,353	I.	151,117
From Wyoming Region..	1.447,602	1,417,313	I.	30,288
" Lehigh " ..	548,367	507,934	I.	40,433
" Schuylkill " ..	855,501	775,106	I.	80,395

	Year. 1888.	Year. 1887.	Inc. or Dec.	
Phila. & Reading	2,064,162	2,758,285	D.	694.123
Lehigh Valley	2,160,972	2,657,397	D.	496,425
Central of N. J....	1,951,451	1,925,077	I.	26,373
Del., Lack. & West.....	2,588,170	2,098.594	I.	489,576
Del. & Hud. Canal Co....	1,743,494	1,498.719	I.	244,775
Pennsylvania.....	1,712,454	1,370.969	I.	341,485
Pennsylvania Coal Co....	587,272	557,622	I.	29,651
N. Y., L. E. & W..... ...	369,831	326,075	I.	43,756
Total...	13,177,806	13,192,738	D.	14,932
From Wyoming Region..	8,541,892	6.874,887	I.	1,667,005
" Lehigh " ..	1,330,530	2.385,265	D.	1,054,735
" Schuylkill " ..	3,305,384	3,932,586	D.	627,202

This statement includes the entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective roads, adjustment being necessary in the compilation to avoid duplications, etc.

The stock of coal on hand at tide-water shipping points May 31, 1888, was 812,425 tons; on April 30, 1888, 733,314 tons· an increase of 79,111 tons.

The following statement shows the general distribution of the entire production of anthracite coal for the year ending Dec. 31, 1887:

To Pennsylvania, New York and New Jersey, 22,508,082 tons; to New England States, 5,590,972 tons; to Western United States, 3,707,118 tons; to Southern States, including Delaware, Maryland and the District of Columbia, 1,739,052 tons; to Pacific Coast, 6,820 tons; to Dominion of Canada, 1,057,737 tons; to foreign ports, 31,237 tons; total, 34,641,018 tons.

The New Iowa Rates.

The Iowa Commissioners have sent out their new tariff. The table below gives the rates for the principal distances, in cents per 100 lbs. Below each rate is given the rate for the same class according to the tariff of May 10:

Miles.	1st.	2d.	3d.	4th.	5th.
5.....	14.00	11.90	9.34	7.00	4.90
	15.00	12.80	10.00	7.50	5.00
10.....	14.08	12.58	10.10	7.40	5.70
	17.00	14.50	11.30	8.50	8.00
20.....	16.40	13.94	10.94	8.20	5.70
	21.00	17.90	14.00	10.50	8.30
50	20.00	17.00	13.34	10.00	7.00
	28.00	23.80	18 70	14.00	11.20
100.....	24.00	20.40	19.60	12.00	8 50
	38.00	32.30	25.30	19.00	15.20
150..	32.00	25.30	19.50	15.30	11.30
	45.00	38.30	30.00	23.50	18.00
200.....	40.00	30.20	23.00	18.60	14.20
	50.00	42.50	33.30	25.00	20.00
250.....	48.00	35.10	26.50	21.80	18.10
	55.00	46.80	36.70	27.50	22.00
300.....	56 00	40.60	30.00	25.00	20.00
	60.00	51.00	40.00	30.00	24.00
350.....	58.50	42.70	32.50	37.50	22 50
	65.00	55 30	42.30	32 50	26.00
400.....	61.00	45 60	35 00	30.00	25.00
	70.60	59.50	46.70	35.00	28.00

Five additional special classes are also given for horses, cattle, hogs, sheep, and slack coal, respectively. The tariff goes into effect June 28, and the roads are divided into three classes, A, B and C. The rates given above are for class A. Roads in class B may charge 15 per cent. and those in class C 30 per cent higher than these figures.

Class A roads are the Chicago & Northwestern, Chicago, Burlington & Quincy, Chicago, Rock Island & Pacific, Chicago, St. Paul, Minneapolis & Omaha, Illinois Central, Kansas City, St. Joe & Council Bluffs, Sioux City & Pacific, Toledo, Peoria & Western, and the Union Pacific. The B class are: The Burlington, Cedar Rapids & Northern, Chicago, Milwaukee & St. Paul, Omaha & St. Louis. All the other roads go into class C. It is the general opinion, however, that practically the minor roads will have to adopt the schedule rates, as competition will compel them to do so at competitive points, and the long and short haul clause of the law will force them to give their competitive rates to all points. The Commissioners have retained the tariff as they originally adopted it on all distances below 100 miles.

Railroad Earnings.

The comparative statement of operations of the Nashville, Chattanooga & St. Louis for the month of May and the 11 months to May 31 is as follows:

Month of May:	1888.	1887.
Gross earnings.....	$252,797	$253,200
Oper. expenses.....	162.150	137,091
Net earnings.....	$90,647	$116,109
Interest and taxes.....	66,077	56,719
Improvements.....	11,418	19,512
	$79,395	$76,231
Surplus	12,252	39,878
For 11 months—ending May 31:		
	1888.	1887.
Gross earnings..... ...	$2,863,472	$2,534,177
Oper. expenses	1,647,471	1,455,370
Net earnings.....	$1,216,001	$1,077,807
Interest and taxes.....	691,671	653,279
Improvements.....	135,424	100,809
	$827.096	$754,088
Surplus.....	$388,904	$323,719

The statement of the Western New York & Pennsylvania for the quarter ending March 31 is as follows:

	1888.	1887.	Inc. or Dec.	
Gross earnings	$656,306	$591,276	I.	$65,030
Oper. expenses.....	478,371	580,015	D.	101,644
Net earnings...	$177,935	$11,261	I.	$166,674
Other income..		2,074	D.	2,074
Total income	$177,935	$13,335	I.	$164,600
Fixed charges....	163,542	145,076	I.	19,466
Total net income....	$13,393	Def. $131,741	D.	$145,134
Cash on hand.....	80,453			
Surplus.....	947,126			

Earnings of railroad lines for various periods are reported as follows:

Month of May:	1888.	1887.	Inc. or Dec.		P.c.
Mar., Col. & Nor.	$6.023	$5,749	I.	$274	4 8
Net.....	2,865	3,613	D.	748	20 7
Nash., C. & St. L.	252,797	253,201	D.	404	0.2
Net..... ..	90,647	116.110	D.	25,463	21.6
Oreg. R. & N. Co.	* 503,000	426,428	I.	76,572	17.8
Net	* 170,000	166,925	I.	3,075	1.8
Rich. & W.P.Ter.					
Rich. & Danv ..	334,149	300.296	I.	33,853	10.0
Net...	131 684	114,041	I.	17.643	15.0
Virginia Midl...	150,232	139,678	I.	10,554	7.2
Net.....	66,421	56,096	I.	10,425	18.0
Char., Col.& A.	58,042	49,327	I.	8,715	16.3
Net.....	16,464	5,390	I.	11,074	220.0
Col. & Gr. Div..	37,776	27,503	I.	10,273	37.1
Net.....	9,588	Def.11,447	I.	21,035	191.0
W. N. Car. Div.	52,724	57,334	D.	4,610	7.0
Net.....	16,212	5,433	I.	10,779	200.0
To. R. & W. P..					
Ter. system..	873,392	766,545	I.	106,847	13.8
Month of April:					
Bur., C. R. & No.	$193,176	$235,216	D.	$42,040	12.1
Net	27,387	45,208	D.	17,821	37.7
Central of Iowa.	103,191	89,824	I.	13,367	14.6
Net.....	Def. 5,706	Def.12,173	I.	6,467	50.0
Eliz.,Lex. & B. S.	66,637	78,584	D.	11,947	14.1
Net.....	8,917	22,936	D.	14,019	63.6
Gr. Trunk of C....	£285,982	£307,179	D.	£21,197	6.8
Net.....	86,391	99,400	D.	13,009	13.1
Chic. & Gr. T....	53,729	62,974	D.	9,175	14.5
Net.....	14,219	17,407	D.	3,188	17.7
D., G. H. & Mil.	19,101	21,124	D.	2,023	9.5
Net.....	3,338	4,647	D.	1,309	25.0
Keok. & West....	$24,651	$21,630	I.	$2,421	9.5
Net.....	294	2,489	D.	2,204	100.0
Mex. National....	213,027	156,535	I.	56,492	36 0
Net.....	Def. 3,962	34,224	D.	38,186	111.7
Ore. Imp. Co.....	440,106	304,804	I.	135 302	44.4
Net.....	129,298	77,774	I.	51,524	66.2
Southern Pacific:					
Pac. Sys..	2,943,343	2,267,930	I.	675,413	29.7
Net.....	1,109,917	970,077	I.	139,840	14.3
Total So. Pa.Co.	3,867,895	3 034,525	I.	833,370	27.4
Net...	1,361,371	1,098,309	I.	263,062	24.0
Five months—Jan. 1 to May 31:					
Mar., Col. & Nor.	$34,211	$21,400	I.	$12,811	57.1
Net.....	13,518				
Nash , C. & St. L.	1,261,834	1,213,209	I.	48 625	3.8
Net.....	496,809	524 193	D.	27,384	5.1
Oregon R.& N.Co.	*2.257,631	1,836,178	I.	421,453	22.9
Net.....	*705,724	638,314	I.	67,410	10.5
Rich.& W. P Ter.					
Rich. & Danv..	1,935,212	1,684.138	I.	251,074	14 9
Net	908,252	799.105	I.	107,147	13.4
Va. Mid. Div...	684,764	609,881	I.	74,883	12.1
Net.....	270,183	224.043	I.	46,140	20.6
Char., C. & A..	375,130	327.987	I.	47.143	14.4
Net.....	157,012	140,863	I.	16,149	11.4
Col. & Gr. Div.	259,313	219,556	I.	39,757	17.7
Net	101,983	49,555	I.	52,428	106.1
W.N.Car. Div..	260,103	269,110	D.	9,007	3.4
Net	46,833	47,872	D.	1,039	2.1
To. R. & W. P.					
Ter. system..	4,996,785	4,372,110	I.	624,675	14.2
Four months—Jan. 1 to April 30:					
Bur., C. R.& Nor.	$832,032	$938,237	D.	$106,205	11.3
Net	161,992	266,801	D.	104,809	39.1
Central Iowa. ..	433,729	429,904	I.	3,825	0.7
Net	26,623	53,216	D.	26.593	49.1
Eliz.,Lex.& B. S..	304,570	305,293	D.	723	0.2
Net.....	64,844	84,529	D.	19,685	22 6
Grand Tr. of C..	£1,064,404	£1,172,553	D.	£108.149	9.2
Net.....	238,377	315,008	D.	76,631	24.1
Chic. & Gr. Tr..	212,265	225,575	D.	13,310	5 8
Net..... ...	49,668	55,543	D.	5,875	9.0
D., G. H. & Mil.	67,939	77,204	D.	9,265	11.7
Net.....	10,153	13.400	D.	3,247	24.1
Keok & West.... .	$102,131	$98.875	I.	$3,256	3.1
Net	16,093	25,840	D.	9,747	36.0
Mexican Nat.....	780 548	594,294	I.	195,254	32.8
Net.	Def.50,407	108,545	D.	158.952	146.3
Ore Imp. Co.....	1.634,260	1,100,661	I.	533,599	48.5
Net...	300,636	212,398	I.	88,238	41.5
Southern Pacific:					
Pacific Sys.....	10,644,270	7,870,022	I.	2,774,248	35.2
Net.....	3,699.832	3,071,208	I.	628,624	20.4
Total So. Pacific.	14,470,341	10,813,040	I.	3,657,301	33.8
Net.....	4,794,993	3,480,761	I.	1,314,232	37.7

* Estimated in 1888.

Month of May:	1888.	1887.	Inc. or Dec.		P.c.
Atlantic & Pac. ..	$243,052	$263,507	D.	$20,455	7.6
Buff., R. & Pitts..	158,622	186,494	D.	27,872	14.5
Bur., C. R.& Nor.	194,501	216,788	D.	22,287	10.1
Cairo, V. & Chic .	54,055	63,102	D.	9,047	14.3
Cal. South.....	150,985	118,256	I.	31,829	26.2
Canadian Pac ..	952,000	945,493	I.	6,507	0.5
Cape F. & Y. V...	21,918	18,866	I.	3.052	16.6
Central of Iowa..	103,865	94 018	I.	9,847	9.6
Ches., O. & S. W..	149,093	131,382	I.	17,711	13.0
Chic. & Atlantic..	202,616	144,883	I.	57,733	40.0
Chi. & East. Ill..	167,834	155,953	I.	11,881	7.1
Chi. & Ind. Coal..	39,630	27,620	I.	12,010	44.4
Chi., Mu. & St. P.	1,766,500	1,866,713	D.	100,213	5.3
Chic. & N. W.....	2,089.800	2,102,149	D.	12,349	0.5
Chic & Ohio R ..	3,911	4,891	D.	980	20.0
Chi.,St. P.& K. C.	164,848	97,434	I.	67,414	69.1
Chi. & W. M.. ..	122,648	116,493	I.	6,155	5.1
Cin., J. & Mack..	40,635	33,574	I.	7,061	21.2
Cin.,N. O. & T. P.	300,867	261,754	I.	39,113	14 9
Ala. Gt. South.	115,248	114,789	I.	459	0.4
N. Ori. & N. E.	60,301	47,222	I.	13.079	27.7
Vicks. & Mer..	29,632	37,056	D.	7,424	19.1
V., Shre. & P..	30,525	31,531	D.	1,006	3.2
Total. C., N. O. & T. P. Sys...	536,573	492,352	I.	44,221	8.9
Cin , R. & Ft. W.	32,299	31,717	I.	582	1.8
Cin. & Springf'd.	94.113	90.932	D.	2,819	2.1
Cin., W. & Balt..	165,149	156.799	I.	8,350	5.1
Cleve.,Ak. & Col.	53,537	45,511	I.	8,026	17.7
Cl., C., C. & I....	319,891	313,527	I.	6,364	1.7
Cleve. & Mar.....	20,095	22,487	D.	2,392	9.1
Col. & Cin. Mid..	29,874	21,501	I.	8,373	38.1
Col., H. V. & T...	274,698	197,144	I.	77,554	39.1
Den. & R. G.....	622,000	611,241	I.	10,759	1.6
Den. & R. G. W..	92,625	75,356	I.	17,269	22.6
Det., B. C. & Al..	48,700	46,067	I.	2,633	4.4
Det., Lan. & No.	78,386	97,560	D.	19,174	20.0
Du., S. S. & At...	114,106	150,842	D.	36,736	24.0
E. Tenn., V. & G.	418,679	373,566	I.	45,113	12.1
Ev. & Indianap...	19,393	17,554	I.	1,839	5.9
Ev. & Terre H....	64,824	71,931	D.	7,107	10.0
Flint & P. M...	216,080	226,982	D.	10,902	4.4
Fla. Ry. & N. Co.	92,125	84,316	I.	7,809	8.3
Ft. W.& Den. C...	74,239	53,812	I.	20,427	37.7
Georgia Pacific..	89,377	85,999	I.	3,378	3.5
Gr. Rapids & Ind.	185,966	181,571	I.	4,395	2.2
Other lines.	15,097	13,357	I.	2,040	15.4
†Grand Tr.of Can.	1,405,375	1,460,933	D.	55,558	3.8
Gulf, Col. & S. F.	224,105	155,395	I.	68,710	43.8
Houston & T. C..	173,461	147.411	I.	26,050	17.7
Ill. C..(I.& S.Div.)	954,487	882,980	I.	71,507	8.1
Cedar F. & M..	7,050	13,573	D.	6,523	46.1
Dub. & Sioux C.	59,402	35,525	D.	6,123	9.2
I. F. & S. City..	49,700	54,193	D.	4.493	7.4
Kanawha & Ohio.	22,759	13,973	I.	8,786	61.5
*K. C., Ft. S. & M.	208,808	253,778	D.	44,970	17.4
*K. C.,Cl. & Spr..	12,107	9,823	I.	2,284	22.2
Keok. & West . .	23,295	25,145	D.	1,850	4.0
Kingston & Pem.	17,328	15.062	I.	2,266	13.3
Lake E. & W ...	153,754	142 346	I.	11,408	7.7
Lehigh & H.....	23,626	16,548	I.	7,078	43.7
L. Rk. & M	45,884	44,996	I.	888	2.0
Long Island.....	277,880	254,707	I.	23,182	9 1
Lou., Ev. & St. L.	79,643	86,791	D.	7,148	8.1
Louisv. & Nashv.	1,289,925	1,253,889	I.	36,036	2.8
Louis., N. A. & C.	185,132	177.570	I.	7,562	4.0
Lou., N. O.& Tex	162,319	114,917	I.	47,402	41.2
Mar., Col. & Nor.	6,023	5.749	I.	274	4.8
Memphis & Chas.	120.537	118,447	I.	2,090	1.8
‡Mexican Central	466,224	391,743	I.	70,481	17.7
b‡Mexican Rail..	280,062	268,227	I.	11,835	4.1
Mil., L. S. & W..	244,038	302.432	D.	58,394	19.3
Mil. & Northern.	85,680	75,063	I.	10,617	13.3
Minn. & St. L....	106,576	134,872	D.	28,296	21.0
Mobile & Ohio...	212,502	193,667	I.	18,835	9.4
Nash., C. & St. L.	252,797	253,201	D.	404	0.2
Nat.,Jack. & Col.	10,751	12,808	D.	2,457	16.6
N. Y. C. & H. R..	2,824,884	2,887,020	D.	62,176	2.1
N. Y. & Northern	51,743	48,194	I.	3,549	6 2
N. Y., O. & West.	142,758	124.577	I.	15,181	11.8
Norfolk & West..	383,867	294,617	I.	89,250	30.3
Northern Pacific.	1,527.087	1,049,218	I.	477,869	45.4
Ohio & Miss... ..	285,990	296,162	D.	10.173	3.4
Ohio River.....	35,728	29,595	I.	6,133	20.6
Ohio Southern ..	37,179	36,840	I.	339	0.9
Oreg.R. & N. Co..	503,000	426,428	I.	76,572	17.8
Pitts. & Western.	164,844	146,712	I.	18,132	12.3
Rich. & Danville.	334,149	300,296	I.	33,853	11.0
Va. Mid. Div. ..	150,232	139,678	I.	10,554	7.2
Char., C. & A..	58,042	49,327	I.	8,715	16.3
Col. & Gr. Div..	37,776	27,503	I.	10,273	37.0
West. N. C. Div.	52,724	57,334	D.	4,610	7.0
W.O.& W.Div..	9,650	9.800	D.	150	1.5
Ashev.& S. Div.	7,200	3.944	I.	3.256	100.0
§St. L., A.& T. H.	147,521	149,755	D.	2,234	1.3
Branches	67,720	67.645	I.	75	0.1
St. L., A. & Tex..	208,292	173,918	I.	34,374	20.0
St. L. & San F...	411,396	481,072	D.	69,676	14.3
St. P. & Duluth ..	129,792	144,856	D.	15,064	10 4
St. P , M. & Man.	743,455	572,517	I.	170,938	29.6
San A. & Aran.P.	82,343	38,415	I.	43,928	113.2
Shenandoah Val..	68,000	69,849	D.	1,849	1.4
Stat. Isl. Rap. T..	76,991	75,274	I.	1,717	1.3
Texas & Pacific..	456,879	336,144	I.	120,735	35.7
Tol., A. A.& N. M.	53,184	38,382	I.	14,802	37.0
Tol. & Ohio Cent.	94 876	76,137	I.	18,739	23.7
Tol., P. & West...	72,352	77,582	D.	5,230	6.5
Wabash West....	468,638	475,440	D.	6,802	1.4
West. N. Y. & P..	239,000	214,594	I.	24,406	11.2
Wheeling & L. E.	70,170	57,744	I.	12,426	21.1
cWisconsin Cent..	208,126	268,710	I.	29,416	10.8
Total..... ..	$27,739,727	$26,253,317	I.	$1,486,410	5.6

* Includes three weeks only of May in each year.
† For four weeks ended June 2.
‡ Mexican currency.
§ Including Indianapolis & St. Louis.
b For four weeks ended May 26.
c All lines.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

ANNUAL REPORTS.

The following is an index to the annual reports of railroad companies which have been reviewed in previous numbers of the current volume of the *Railroad Gazette:*